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GAS LIGHT JOURNAL

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[OFFICIAL NOTICE.]

Seventh Annual Meeting, Michigan Gas Association.

MICHIGAN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
RACINE, WIS., Jan. 17, 1900.

To the Members of the Michigan Gas Association: The Seventh Annual Meeting of the Michigan Gas Association will be held in the city of Detroit, on Wednesday, the 21st, and Thursday, the 22d day of February next. Headquarters will be at the Russell House, where also the meetings of the convention will be held. Rates $3.50 and upwards per day for room with bath, and $2.50 and upwards without bath.

H. H. HYDE, Secretary.

BRIEFLY TOLD.

PRESENT STATE OF THE ACTION BY THE WESTERN GAS ASSOCIATION RESPECTING THE INTERNATIONAL CONGRESS OF GAS MEN.—Heretofore we reported the preliminary step taken by the Western Gas Association in the matter of the Association's reply to the invitation of M. Theophile Vautier, President of the Society of French Gas Managers, that the Association should take part in the proposed International Congress of Gas Men, to be held in Paris, France, next September, during the coming days of the Exposition Universelle. This initial move in the correspondence was made last September, when President McDonald, of the Western Association, assured M. Vautier that himself and his colleagues were heartily favorable to the proposition, and would do all in their power to assist the French Society in the development of its aims. Last month M. Vautier replied to President McDonald's letter, and in time, acting in counsel with the Western Association, President McDonald transmitted his second communication to M. Vautier. The correspondence in the second stage, which is here reproduced, explains itself:

SOCIETE TECHNIQUE DE
L'INDUSTRIE DU GAZ, EN FRANCE,
PARIS, Dec., 6, 1899.

Mr. President: I have the honor to acknowledge the receipt of your letter of September 29th last, and I beg to thank you for your support in connection with the International Congress of the Gas Industry.

I would be greatly pleased if you would accept the title of Corresponding Member of the Committee on Organization of the International Congress of the Gas Industry in 1900. I would be further assisted were you to name to us, so that we may be able to confer upon them a like title, a certain number of competent persons of reputation in the industry, who would accept with you the task of investigating questions of mutual interest to our fraternity, with a view to presenting such results to the Congress, either personally or by accredited reports.

We propose to send to the members of your Association a circular which will inform them of the sessions of our Congress, the dates for which have been definitely named for September 3rd, 4th and 5th, 1900. In this circular, the forwarding of which may not longer be delayed, will appear the names of the corresponding members who have notified us of their acceptance of such naming; and, doubting not that you will accept our choosing, we have taken the liberty of placing your name on that list.

Later we will ask our technical papers to publish a second list which will include those who have not as yet sent in their acceptances, as well as the names of the persons you will communicate to us and who are to work in co operation with you. Agreeably, Mr. President, accept the assurances of my most distinguished consideration.

TH. VAUTIER,
The President.

MR. WILLIAM MCDONALD,
President Western Gas Association,
Albany, N. Y.

OFFICE OF PRESIDENT, WESTERN GAS ASSOCIATION,
ALBANY, N. Y., Dec. 26, 1899.

M. TH. VAUTIER, President,
Societie Technique de l'Industrie du Guz, en France,
Paris, France.

Dear Sir: I am in receipt of your favor of the 6th inst., in which you kindly ask me to become Corresponding Member for the Western Gas Association, in connection with the International Congress of Gas Men, that is to be held, according to your letter, at the Exposition Universelle, the 3rd, 4th and 5th of September, 1900. I also received your communication of October 13th, but did not feel warranted in taking up the questions therein named until I had had an opportunity of laying the whole matter before the Executive Committee of the Western Gas Association. This I had the honor of doing, at Chicago, on the 12th of this month, and was unanimously requested by the Committee to accept the position of Corresponding Member for the Association in connection with the Congress. In that understanding it affords me very great pleasure to accept your fraternal invitation to act in the manner named.

In connection with the Executive Committee of our Association, I have examined carefully the questions that have been suggested by your Society for discussion during the sessions of the Congress. I also note that the American Society of Gas Lighting, the headquarters of which are in New York city, has considered the questions suggested for discussion at the Congress, and has recommended to you the advisability of debating the matter of an international standard measure of luminosity. The Western Gas Association joins heartily with the Society of Gas Lighting in asking that that question may be considered.

For the Western Gas Association, I would suggest in connection with your seventh topic, some consideration of the influence that surrounding color has on the diffusion of light—from gas or other source of lighting. Also, might it not be well to consider the advantage or economy of supplementary water gas apparatus? Again, the mechanical charging and discharging of retorts; and possibly the broad question of mechanical appliances in general for use in gas works?

These last are matters that have been freely discussed in this country, and I presume they are not so familiar to your Society. I, however, only suggest that it might possibly be well to give some attention to them.

I shall be very happy to receive any further communication from you on this subject, and to do whatever may be in my power to assist in making the Congress a success. You can readily understand that it is very difficult for us now to appoint members who are technically familiar with the gas industry to represent us at the Congress, for the reason that we do not know at present who will have the time and opportunity to attend and who are capable of discussing satisfactorily the questions to be brought before it. It is my opinion, however, that in due time the gas fraternity of this country will appoint some one to represent them at your Congress.

The Vice President of the Association, Mr. I. C. Copley, is intending to visit Europe, leaving here some time in February, and I have no doubt that he will take occasion to call upon you. Any favor that you might show to Mr. Copley would be very much appreciated by the Western Gas Association of the United States. The next meeting of the Association will be held in May, 1900, and I have no doubt Mr. Copley at that time will be elected President, so that at the time of the Congress he will have replaced me as President of the Western Gas Association. I propose to give to Mr. Copley a letter of introduction to you. I am sure you will find him to be a very courteous gentleman, and he will have full authority to act for the Western Gas Association in any matters connected with the Congress. Assuring you of my great esteem, I am, sincerely yours,

WM. MCDONALD, President,
Western Gas Association.

DEATH OF MR. JAMES GARDNER, JR.—A brief telegram, dated the 18th inst., at Pittsburg, Pa., from Mr. E. H. Henderson, informs us that Mr. James Gardner, Jr., son of the late Mr. William Gardner, died in Colorado Springs, Col., the night of the 16th inst. He was the worthy son of a worthy sire, and had battled long and heroically with an illness that unfortunately would not be denied. In due time we will print some record of his life.

DEATH OF MR. DAVID E. KNIGHT.—"E. C. J.," writing from San Francisco, Cal., under date of the 9th inst., says: "The gas fraternity is again called upon to mourn the loss of one of its pioneers, and the Pacific Coast Gas Association one of its most valued members. David E. Knight, President and Superintendent of the Marysville Gas and Electric Company, died at his home in Marysville, Cal., January 5th, 1900. Mr. Knight was born in Tunbridge, Vermont, October 24th, 1825, came to California in 1852, and took up his residence in San Francisco, known in those days as Yerba Buena. He first became identified with the gas business at Sacramento, where he established and successfully conducted a gas plant which he later sold out. In 1856 Mr. Knight went to Marysville and, in May, 1858, there formed the Marysville Coal Gas Company, of which he was elected President and Superintendent. The City of Marysville was first lighted by this Company, August 18th, 1858. In 1867 he established a woolen mill, taking up the posts of President and Manager to the Company, which positions he held until the plant was recently destroyed by fire. Mr. Knight also at one time owned a line of steamers running between Marysville and San Francisco, and was practically identified with every enterprise which has made Marysville a thriving city. In public life Mr. Knight held many positions of trust, including that of Levee Commissioner for the City of Marysville, continously since 1880. He was Alderman of the city during the years 1866 and 1867, and again in 1874 and 1875. At the time of his death he was President and General Manager of the Marysville and Yuba City Street Railway, President of the Marysville Democrat Publishing Company, and was President and Director in many other local corporations. The deceased was a prominent Odd Fellow and Free Mason, being a member of Corinthian Lodge, No. 9, F. and A. M., Washington R. A., Chapter No. 13, Marysville Council, No. 3, R. and S. M., and Marysville Commandery, No. 7, Knights Templar. In the death of Mr. Knight the City of Marysville has lost a man who helped to make the city, and one whose place cannot be filled. He was a man of rugged personality and strong in his friendships. Scorning to pause for the enjoyment of that retirement to which his efforts had entitled him, and which his success had made possible, he labored on, each day's duties cheerfully met, each night's repose honestly earned until the last, when at the summons which we all shall have to meet, with the aged partner of his life's joys and sorrows at his side, he passed away as a man might choose to go. Loved and respected in life, in death he is mourned by all who knew him. The funeral took place at 2 o'clock Sunday afternoon, Jan 5th, under the auspices of Marysville Commandery, Knights Templar, and the interment was in the family vault at the City cemetery. Mr. Knight had the largest funeral ever known in Marysville. It was attended by all classes of individuals, and, besides those who loved and respected him as friend or business associate, there were numbers who had partaken of his bounteous and unostentatious charity, who felt that their friend in times of need had gone from them. The Pacific Coast Gas Association was represented at the funeral, and sent an appropriate floral design—the emblem of the Association in flowers."

ABSTRACTS AND CENSORSHIP.—Our issue for November 27th, 1899, contained short mention of the cause that obliged us to forego the continued reporting of the discussions on the papers that were read at the last meeting of the American Gas Light Association. Not to needlessly bother our readers over the matter it may be tersely said that the Secretary of the Association, interpreting his duty as he saw it, declined to permit us to continue abstracting the discussions, unless such abstracts were submitted "to the Secretary for approval before publication." We obeyed his ruling, in that no further abstracting was done, much to our regret and to that of those who read the JOURNAL and who support the Association. A concise statement of the case will be found in our issue for November 27, 1899. The present reference to the affair is prompted by the following editorial mention respecting it which appeared in the columns of *The Engineering Record*, dated the 13th inst.: "A step backward has been taken by the American Gas Light Association, through its Secretary, in the matter of its publications. It lately refused to allow an esteemed contemporary devoted to the gas industry to have access to the discussions on the papers presented at a recent meeting. The ground for this refusal is said to be a difference of opinion between the Secretary and the Editor as to what constitutes an abstract. It is with considerable regret that mention is made of this divergence by the American Gas Light Association from the practice of other national societies. The time is now passed, and even a hasty investigation by the Association's Council will establish the fact thoroughly, when it pays an engineering society to refuse access to its professional papers and discussions to any reputable technical journal. In a very large measure, the success of technical societies is now due to the wide spread knowledge of their proceedings which is furnished by the class journals. It is the height of absurdity to insist that such a journal will reduce in any serious degree the circulation of a professional society's publication by reports of its meetings, no matter how full they may be. The wider the publicity given to the proceedings of such a society, the greater will be its growth and reputation."

Foundations for Metal Tanks.[1]

By Mr. R. J. Milbourne.

Whenever the ground available for the erection of a new tank and gas holder is of such a nature that the adoption of the ordinary brick or concrete tank would be a matter accompanied by grave risks and expense, the dangers and difficulties may be avoided by the adoption of a metal tank. Mild steel is the material now almost universally adopted; being possessed of qualities superior to wrought or cast iron, and less in cost than the latter. But whether the material selected be steel or cast or wrought iron, the conditions necessary in the provision of foundations would be exactly the same in either case.

Substratum.—After the form of tank has been decided upon, the next, and probably the most important, point to receive attention will be the foundation upon which the strength and stability of the tank, holder, and framing depend. The chief object to be attained in the construction of the foundation, is the formation of such a solid base that a minimum amount of subsidence shall take place under the maximum load—that is to say, after the erection of the complete structure, and the tank has been filled with water. All heavy structures of this class will settle to a certain extent, for the reason that all soils are more or less compressible under the weight brought upon them.

It is not, however, sufficient to aim only at the minimum of settlement, but it is of the utmost importance to insure that whatever settlement does take place shall be of a uniform nature throughout the whole bearing surface of the foundations. Otherwise the guides of the tank and holder are liable to be thrown out of the vertical position; thus causing the accurate working of the gasholder to be impaired or interfered with in a more or less serious degree. A soft, marshy ground, of even consistency, is very frequently met with, and is much more favorable for our purpose than a somewhat harder ground of varying strength or thickness, as settlement in this latter case is liable to be more unequal than in the former. The nature of the bearing strata having been carefully ascertained by trial or boreholes, the safe bearing strength of the ground per square foot of area can then be determined.

It is hardly advisable or possible to attempt to give any general rules for the safe bearing strength of the various kinds of ground that may be met with. Each site must be judged for itself. But, speaking roughly, it may be said that alluvial soil or quicksand ought not to be loaded with more than about 1,000 pounds per square foot; a soft clay 2 or 3 feet below the surface, from 1,000 to 1,700 pounds; compact clay 3,000 to 5,000 pounds.

Concrete Bed.—The thickness of the concrete bed upon which the tank is to be erected, though usually determined by experience, may vary from 9 inches to 2 feet or 2 feet, 6 inches, according to the nature of the substratum. If the ground is soft and loose, the area of bearing surface can be enlarged by increasing the margin of the concrete bed beyond the usual allowance of 9 inches all around the outside of tank, so as to insure that the maximum pressure upon the subsoil shall not exceed the safe pressure per square foot. It should be borne in mind, however, that when this increase in the diameter of the concrete bed is rendered necessary by these local circumstances, the thickness of the bed should also be increased to a certain definite proportion, in order to obtain the full advantage of the enlarged surface. As fracture is most likely to occur at an angle of about 60° with the horizontal, as shown by the thick dotted lines in Fig. 1, causing the concrete bed to rupture in a number of triangular prisms, shearing or sliding over each other, the effective diameter of the concrete bed at the base may be taken as equal to the diameter indicated by d^3 in Fig. 1. From this it will be apparent that, to obtain an enlarged bearing surface equal to d^3, the depth of the concrete bed should be made equal to t^3, as shown in the figure. In some extreme cases, where the increased bearing surface could only be obtained by an abnormal thickness of concrete, it might be more economical to build the tank and holder upon a foundation of piles. But this is beyond the scope of the present article.

Sometimes the standards forming the guide framing of the gasholder are secured to the sides of the tank; but when they are carried down to, and take a firm bearing on, the concrete bed, it is very important that the pressure on the substratum should be uniform. The projecting portions of the concrete bed intended to carry the standards or columns should, therefore, be proportioned accordingly. Furthermore, it may be necessary that the thickness should be increased at these points, as indicated by dotted lines in Fig. 2, in order to avoid any danger of the concrete bed breaking across. The foundation for the

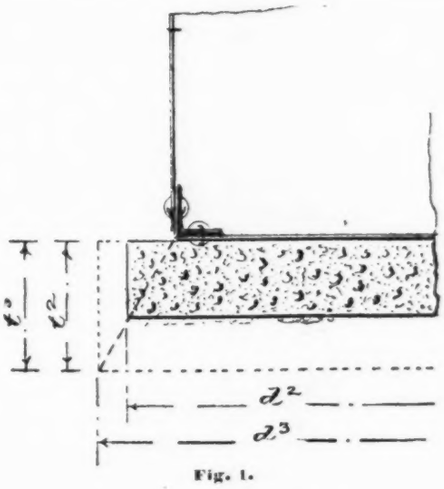


Fig. 1.

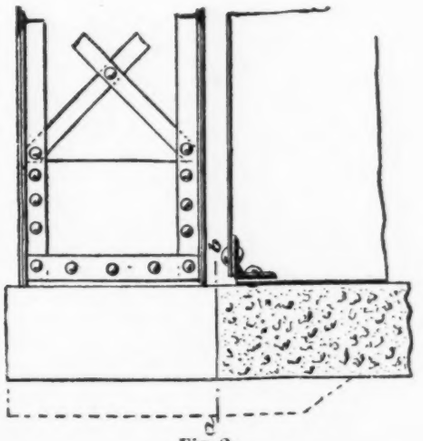


Fig. 2.

standards is shown in Fig. 2, and it may be considered as in the condition of a cantilever carrying a distributed load tending to produce fracture at *A B* as indicated above. The recess which is formed in the concrete bed for the reception of the inlet and outlet pipes to the gasholder, should either be bridged over with light steel rolled joists, arched openings, or dwarf walls of brickwork or concrete, built up to afford a support for the bottom plates of the tank, immediately over this recess, after the pipes have been fixed in position and the joints properly made. This method is decidedly better than filling up the recess, or bedding both the pipes into the concrete bed in a solid mass. The small bed of concrete which is intended to form the foundation for the short vertical inlet and outlet pipes may be detached from the main tank foundation.

The horizontal pipes which pass under the bottom of tank are more reliable if made of steel instead of cast iron, owing to the flexibility of the former, which may prove advantageous in case of excessive settlement.

The character of the concrete should be made to suit the local conditions. A mixture suitable to most instances would be that composed of one part of Portland cement by measure, one and a-half parts of sharp clean sand, and four and a-half parts of broken stone, bricks, or any other suitable material. Almost any hard substance may be considered suitable when broken up, such as old clay retorts, broken earthenware, or burnt clay of an imperishable kind. Fragments of a porous nature are, however, preferable to those which possess a smooth or glossy surface, as the Portland cement will more readily adhere to them, and so form a compact and close mass free from voids. The pieces of broken brick or other material which it is intended should form the aggregate of the concrete, should be of such a size that each piece will pass through a one and a-half to two inch gauge or screen; the fragments being angular in shape. These materials should be carefully gauged in wooden, bottomless boxes placed on a temporary timber platform (not upon the bare ground, as it is necessary to keep the concrete clean from all earthy matter); the measuring boxes being filled up one above the other, with the matrix or cementing material on top. These boxes or frames, upon being removed, will cause the

1. *Journal of Gas Lighting.*

constituents of the concrete to assume a conical shape mound upon the timber platform suitable for mixing. The whole mass is then to be thoroughly incorporated by being turned over twice dry. A sufficient quantity of water, applied through a fine spray or rose, should then be added, to render the concrete plastic, and to ensure the cohesion of the various ingredients. After the concrete has again been turned over twice wet, it should be rapidly filled into barrows, wheeled to the site, and tipped into the required position in layers about 9 or 12 inches thick and carefully rammed. The ramming must not be too prolonged or it will affect the strength of the concrete. The method of conveying the concrete down steeply inclined wooden shoots into the exact position where it is to be deposited is very unsatisfactory, as the heavier portions of the aggregate have a tendency to collect together and separate out from the matrix; thus robbing the concrete of its homogeneity. If the concrete is more than 12 inches thich, it is advisable to use a somewhat slow-setting cement, so that the second layer of concrete can be prepared and placed in position before the first layer has had time to set. In cases, however, where it is impossible to apply the second layer until after the first layer has already set solid, the surface should be swept clean with a stiff brush, then made rough and watered. Concrete laid in cold weather stands better than that laid during hot; mild damp weather is, however, preferable to either extremes.

Excavation.—It is generally advisable to keep the tank as much out of the ground as possible, in order to afford opportunities for regular examination and painting; and also to avoid the necessity for timbering the sides of the excavation, the struts from which would materially interfere with the laying of the concrete bed. Nevertheless, the bottom of the concrete bed should always be laid at least 3 feet, 6 inches below the ground line, to preserve the foundation from the effect of varying degrees of temperature or the percolation of rain water, which, in some soils, causes the foundations to become rent and injured by the contraction and expansion of the ground. A soft clay is very subject to expansion and contraction, owing to variations in temperature; and it is positively dangerous to erect the tank upon such a soil unless it be protected from atmospheric influence, while many soils, otherwise reliable, will assume a soft, muddy condition when exposed to the effects of the atmosphere or to rain water. When, however, the concrete bed is placed at the depth suggested, the difficulties produced by atmospheric influence are unlikely to occur in this country, owing to the protection thus obtained. The excavation should be made about 3 feet larger in diameter than the diameter of the tank, at the top level of the concrete bed, to allow sufficient room for the workmen erecting the tank to get all round the same for riveting up the sides.

Sand Bed.—To ensure the whole of the tank bottom bearing evenly and firmly upon the concrete foundations, the entire upper surface of the concrete should be made perfectly level, and then covered with a layer of clean sand about three-quarters of an inch thick. When the tank is lowered on to the foundations, the rivet heads of the bottom plates bed themselves firmly in this layer of sand, which works up between them and gives an even support to the whole area of the bottom plates.

Foundation Bolts.—It is not necessary to provide any holding down bolts for taking hold of the standards of the gasholder guide-framing when the standards are carried down to the level of the bottom of the tank.

Fender Walls.—In most cases where the tank is erected in "made" ground, such as ashes, cinders, or town refuse, it is advisable to protect the sides from the corrosive action of this filling in. This protection can be obtained by building (say) a 9 inch brick fender wall all round the tank, or by ramming a layer of puddle, at least 9 inches thick, well up against the side plates the full depth they enter the ground.

Filling in.—It is of importance that the foundations should be kept clear of water during the laying of the concrete bed, and also while the lower portion of the tank is being erected; and as soon as the tank bottom and a sufficient depth of the side plates have been rivetted and finished complete, the tank should be carefully lowered on to its foundations, and the surrounding excavation filled in and rammed and made up to the proper level.

Municipal Lighting and Sewerage Plant, Concord, N. H.

The *Electrical World* says that the power station erected by the town of Concord, N. H., which is now nearly ready for operation, is a good example of the better type of municipal plants in New England. The equipment throughout has been planned with the one object of efficiency in view. No expense has been spared to make the plant as nearly as possible automatic in its operation. The installation is a small one, and no great increase is anticipated in its capacity for years to come. Such refinements as might seem almost necessities in a metropolitan plant, for instance, were obviously needless in this case, their economy being limited at a certain point in the range of capacity of a station.

Perhaps nowhere in this part of the country are wages higher than in the Eastern States for such work as is involved in central station lighting and power supply. The general tendency is therefore to reduce the high cost of labor and superintendence, in any particular instance, by getting along with the least possible amount of either. This has been one object at the Concord plant.

The system embraces a complete sewerage connection for the center of the town, the drains being headed and carried to a surge tank and from there pumped through a filter bed to the river. This much was a necessity, and it was a short step to decide to even the load on the power plant which would be required by installing electric lighting apparatus.

The power station is of brick, with pressed brick trimmings and wood truss roof construction. Fig. 1 shows the general arrangement of the apparatus. The chimney is brick, round cored. A covered way leads from the coal and storage sheds to the boiler room. A side track from the B. & M. railroad terminates opposite the former. The boiler room is 5 feet below the engine room, and 6 feet above the basement containing the heater and condenser. A 12-inch brick wall separates the two parts of the building, and communication is provided from both engine room and boiler room to the basement.

The boilers rest on an I beam framework, entirely independent of the brick setting. They are of the horizontal tubular type, built by the Holyoke Steam Boiler Works, of Holyoke, Mass., to the following specification: Diameter, 66 inches; 92 3 inch tubes, 16 feet long; overhanging fronts. Each boiler is fitted with two 3-inch pop safety valves mounted on a special casting from the rear nozzle; with two 11 by 15-inch manholes, cast iron fronts, and Tupper grates. The pressure carried is 125 pounds.

The two engines are tandem compound, condensing, of 125-horse power each, built by the Harrisburg Foundry and Machine Works. They run at 300 revolutions per minute, at a normal pressure of 120 pounds, and are of the 4-valve type. Each engine is direct connected to a 75-kw., 1,100 volt Westinghouse 2-phase generator, the whole outfit in each case being on one bed plate. They will operate 100-volt lamp and motor circuits through transformers.

The engine for the sewerage system is a compound simplex Blake pump, 7 and 14 by 11 and 12-inches. The steam connections for operating this pump are shown in Fig. 2. By means of the cocks *A* and *B* the work can be handled by one or both cylinders, and the pump can be run as either a double or compound engine.

Additional equipment includes a marble switchboard, feed-pump, injector, Blake condenser and primary and auxiliary heaters. It is in the arrangement of this auxiliary apparatus that the promised economy of the plant mainly consists. Perhaps no part of a power station is so delicate a matter to handle as the piping and heating systems. The entire steam equipment of the station, exclusive of the boilers and engines, was in this case embodied in the piping contract, and can be best described as a system complete in itself, forming one harmonious whole.

Steam is taken from the forward nozzles of the boilers. Two 4-inch pipe bends carry it to the main valves, located next the horizontal portion of the bends. From the valves, two additional bends lead to the top of a 7 inch gun metal header, cast in two pieces, with a valve at its center. All steam supply lines are also taken from the top of the header, no separators being used.

A 3 inch pipe leads to a tee, from which steam for the pump, injector, sewer pump and condenser is taken. Pipe bends, 4 inches in diameter, run to the main engines.

The exhaust pipes from the two engines, 8 inches in size, run into a 12 inch main connecting with the feed water heaters, the arrangement being as shown diagramatically in Fig. 3. The two engines can be run in a variety of ways—*i. e.*, either one condensing, either one non-condensing, one condensing, and the other non-condensing, both condensing, both non condensing, thus giving eight possible combinations. The exhausts from all auxiliary apparatus can be run either to the auxiliary heater or into the main free exhaust beyond the relief valve. Steam and exhaust pipes as far as the heaters, and all hot water pipes, are covered with Nonpariel cork. The boilers are coated with magnesia cement.

The condenser suction water is taken through an 8 inch main from the cold well, just outside the building, and the discharge pipe is carried to the hot well. Water for boiler feed can be taken from either the cold well or the hot well by either the pump or the injector. When the pump is in operation, the water from the hot well will be forced

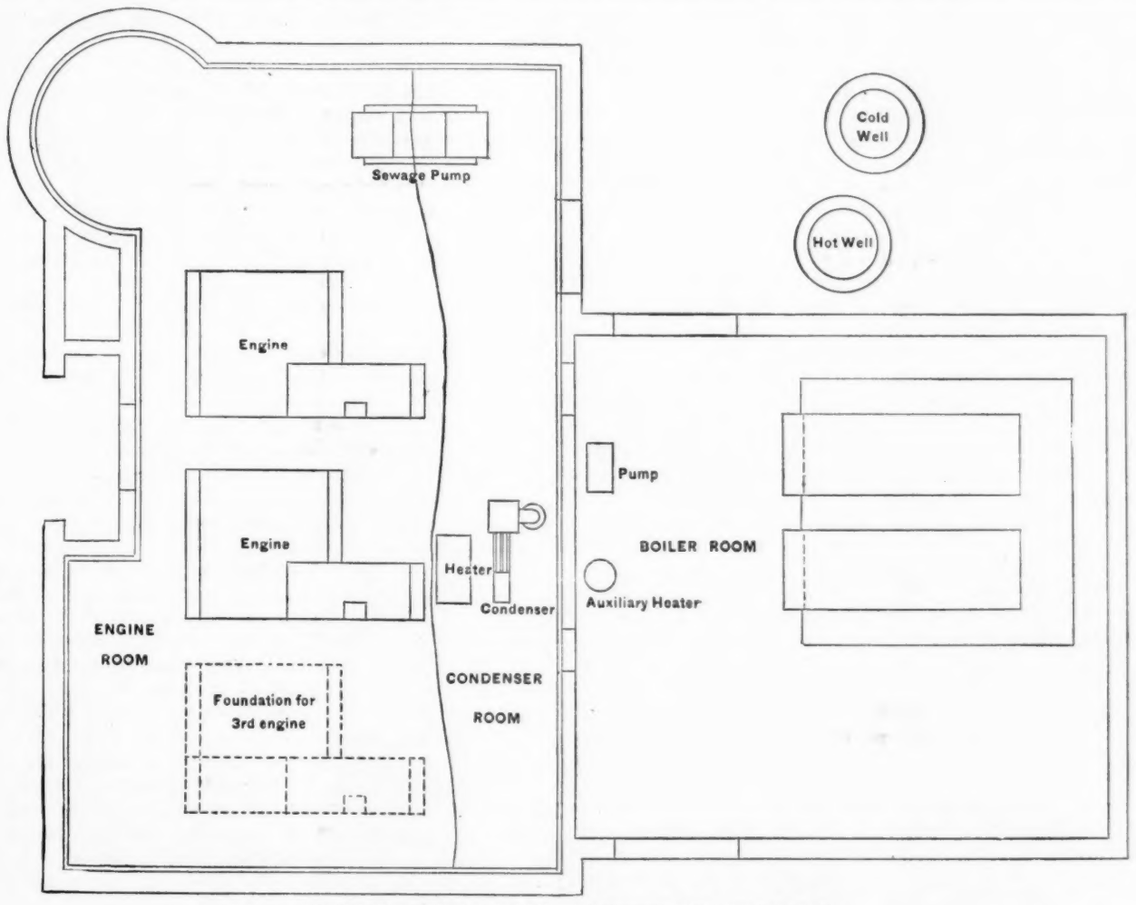


Fig. 1.—Plan of Municipal Lighting and Sewerage Plant, Concord, N. H.

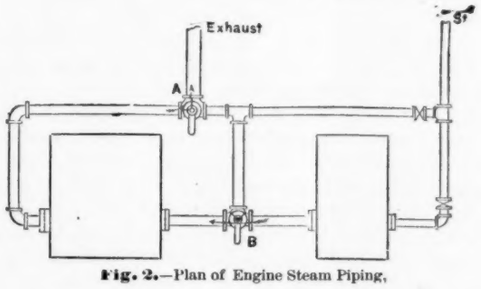


Fig. 2.—Plan of Engine Steam Piping.

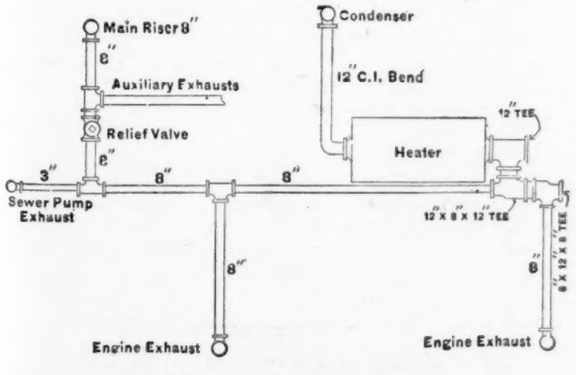


Fig. 3.—Plan of Exhaust Piping

through both the primary and the auxiliary heaters, and a very high temperature should be attained.

The entire steam system is dripped and the condensation returned to the boiler by the Holly gravity return apparatus. This consists of a receiver, into which the drips are carried by gravity, a reducing valve, producing a partial vacuum on the suction side of the separator, and the separator itself, which accummulates the condensation at a point sufficiently elevated above the boiler water line to give the column a pressure sufficient to force its way to the boilers.

The oil used for the machinery in the station is drained into a receiving tank in the basement, from which it is pumped to a supply tank through a filter, and is thence run through the engine bearings repeatedly.

The main points from which high economy is anticipated are the following:

Pipe bends instead of fittings are used to reduce friction and loss of steam pressure in the piping. All condensation is returned to the boilers. The feed water will be delivered to the boiler at a very high temperature. No oil will be wasted. The load will be uniform from dark until daylight. The equipment can be adjusted to correspond very closely with the load. Coal and supplies will be delivered at the door. Water costs nothing, and is of good quality. One man at a time, it is expected, will operate the entire plant.

What is probable economy attainable under these conditions? It is fair to assume that the boilers under actual conditions of temperature and pressure, with skilful management, will evaporate 8¾ pounds of water per pound of coal. The engines, operating under uniform conditions, condensing, will require from 16 to 18 pounds of dry steam per horse power. The generators, at full load, should display not less than 93 per cent. efficiency. From this data, a theoretical efficiency of about 3.1 pounds of coal per kilowatt would result. Reducing this, however, are several indeterminable factors, such as unavoidable losses from radiation and condensation, wastes in starting and stopping, etc. It seems fair to expect that under favorable conditions an economy of 4 pounds should be maintained.

When completed, a working test of the plant will be made by Messrs. Stone and Webster, of Boston, electrical engineers, who designed the entire equipment.

The Explosive Side of Acetylene.

By Mr. Frederick H. M'Gahie, in *Sc. Am.*

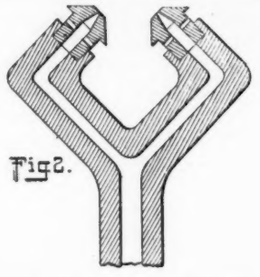
In a recent number of the *Scientific American Supplement*, the writer gave, under this heading, a summary of the facts that scientific investigation had determined in regard to the explosive properties of pure acetylene and its mixtures with air. These experiments have given the limits within which the new illuminant must be produced and utilized to avoid dangerous and uneconomical conditions. Some

cases deviating from those treated possess much interest in having found practical application and having been studied from the point of view of possible explosion. Special burners have to be used with pure acetylene, as the ordinary ones do not give satisfaction with regard to illumination or economy. There is a deficiency in the supply of oxygen afforded by their construction, and combustion with them is not sufficiently complete to give rise to the temperature needed to carry to incandescence the large amount of carbon contained in acetylene. The first solution consisted in making the burners with holes permitting air to be drawn in and mixed with the acetylene just before combustion (Fig. 1). Such would act satisfactorily for a time and then begin to clog up and give a weakened, smoky flame. By adding 15 to 30 per cent. by volume of nitrogen to acetylene, Bullier was able to employ ordinary burners. Others have proposed carbon monoxide, carbon dioxide, hydrogen, water gas, as diluting agents. Of these, Prof. V. B. Lewes, Gas Examiner for the City of London Authorities, has stated: "The great trouble which has presented itself in diluting acetylene with any cheap diluent is that the illuminating power of acetylene is reduced to an enormous extent, and it has been found that hydrogen, carbon monoxide, and water gas are useless for this purpose, as 10 per cent. of acetylene mixed with either of them gives a practically non luminous flame, while if the acetylene is used in sufficient quantity to give a satisfactory light, the percentage of acetylene needed is too high to be commercially possible."

Prof. Lewes made a long series of experiments to discover a cheap diluent that "would maintain the enrichment value of acetylene at something near the value of the gas when burned alone." His conclusions were that "methane was the only gas that would do the work required, and further that the presence of 30 per cent. of methane when mixed with hydrogen, carbon monoxide, or water gas converted it into an excellent diluent, with which 10 per cent. of acetylene gave a 20-candle power gas capable of being burned in ordinary gas fittings."

He found that each 10 per cent. of diluting gas mixed with acetylene raised the temperature necessary to originate explosion 180° F. The practical value of this investigation lies from our point of view in the fact that a mixture containing enough acetylene to make a brilliant illuminant for railroad lighting can be compressed and utilized safely, since the temperature needed to cause explosion is high enough to melt the metal cylinders carrying the compressed gas. Such a system has been introduced with satisfaction on the street railways in Prussia. The preliminary tests were made by the Julius Pintsch Company, of Berlin, and the Prussian railway management in common. The conclusions of Berthelot and Vieille in regard to the explosiveness of acetylene were confirmed by these experiments. A tank was filled with acetylene at 6 atmospheres pressure, and a small pipe entering the tank was brought at a point 59 inches from the tank to a red heat by a gas flame. A violent explosion followed. Another tank was filled with acetylene at a pressure under 2 atmospheres and a pipe heated as befose at a point 59-inches from the tank to a white heat. Local decomposition took place in the pipe, but no explosion occurred. With mixtures of 30 per cent. acetylene and Pintsch oil gas or coal gas compressed to as high a degree as was desirable, it was found that the fusible solder used in the joints of the tank would melt long before a temperature involving explosion of the compressed gas could be reached, and, further, that explosion did not result from heating highly the pipes leading to tanks so filled.

For the small generator involved in the lighting of country houses by acetylene, the above methods are not available, and pure acetylene must be burned to secure a maximum simplicity of system. There are now satisfactory burners based on the principles of the one shown in Fig. 2. The escaping acetylene draws in air for mixing with itself, and the two jets impinge upon each other to form a vertical flame at a distance from the burner sufficient to avoid the overheating of the tops, with the consequent formation of the condensed polymers of acetylene, such as C_4H_2, C_6H_2, that causes smokiness and clogging up with the burners of Fig. 1 type. It has been proposed to mix air in proper porportions for good combustion in usual gas fixtures with the acetylene after its generation and a simple apparatus to this effect has been patented by Dickerson. But it involves an element of danger in introducing an explosive mixture into the distributing part of the system. The air can be mixed with the acetylene all right in the small passages of the burner, since the explosive laws of large masses do not hold in small tubes. Le Chatelier found that in tubes with diameter not exceeding 0.02-inch any mixture of air and acetylene would not propagate explosion. The influence of the diameter of tubes is shown in this table determined by him:



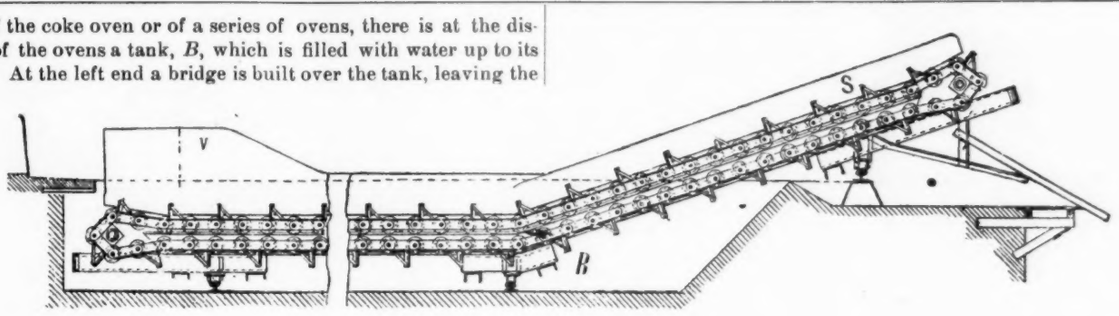
Diameter.	Inferior Limit of Inflammability. Percentage Acetylene.	Superior Limit of Inflammability. Percentage Acetylene.
0.03 inches	7.7	10
0 08 "	5 0	15
0.78 "	3 5	55
1 57 "	2 9	64

There are some who hold that compressed, and even liquefied, acetylene has a future. For compressed acetylene gas Claude and Hess have brought forward a method possessing distinct advantages, that of dissolving acetylene in acetone. At 60° F. acetone dissolves about 26 grammes of acetylene per liter, for each atmosphere of pressure, the factor decreasing with elevation of temperature. Berthelot and Vieille investigated this case to determine the conditions of explosion. They found that the acetylene gas above the liquid acted the same as pure acetylene and would, therefore, detonate by a spark at two atmospheres and above. At pressures up to 10 atmospheres, the acetylene dissolved in the acetone will not explode either through the detonation of the free gas or through the action of a highly incandescent wire placed in the liquid. Above 10 atmospheres a danger region is approached. In experiments at 20 atmospheres pressure inflammation of the free gas gave rise to an explosive pressure of 550 atmospheres. Since the decomposition of acetylene at 20 atmospheres would give around 200 atmospheres pressure, it is evident part of the dissolved acetylene participated in the action. When the inflammation was provoked by an incandescent wire in the liquid part, a pressure of about 5,000 atmospheres was observed. In using cylinders charged according to this system it is imperative to take into account the fact that the pressure increases rapidly with the temperature. In the charged cylinder experimented with, a pressure of 6.5 atmospheres at 57° F. b came respectively 8.4 atmospheres at 80° F., 10.2 atmospheres at 96° F. and 15.8 atmospheres at 140° F. It is desirable then in using acetylene dissolved in acetone to fix the charging pressure at 7 to 10 atmospheres calculated for 60° F. in order to obviate the danger of charged cylinders reaching through exposure to the sun or through being in the vicinity of some source of heat a pressure at which the dissolved acetone would take part in any explosive decomposition. These figures have been given to exhibit the great increase of storage capacity afforded by the system. A cylinder of one liter capacity carrying 0.7 liter of acetone saturated with acetylene at 7 atmospheres pressure will carry 127 grammes of acetylene. The same cylinder will contain but 11 grammes of acetylene gas compressed to 10 atmospheres. If explosion should occur in the free gas of a cylinder properly charged, the maximum pressure obtainable would be below the safety limit of the cylinders employed and the dissolved acetylene would be still available. The advocates of this acetone acetylene method hold that it gives an excellent solution of the problem of storing acetylene in a condensed state in cylinders for subsequent transportation to any place where it is desired to feed a receiver, that it is more economical and safe than acetylene compressed in the ordinary manner, and that it is practically free from all danger in the hands of the skilled workmen who would handle the cylinders. Those who believe in the possibilities of liquefied acetylene have invented valves which make it impossible for ignorant workmen to open them too quickly and to bring about thereby the danger of adiabatic compression in the gaseous column to a degree involving explosion.

Quenching and Loading of Oven Coke.

The *Am. Mfr.* reports that a novel form of conveyor for coke ovens has been designed by Mr. Joseph Muller, of the Mathias Colliery at Essen, Germany, the object of which is to take the coke as it comes from the ovens in a red hot state, and to at once quench it in water, raise it out of the water, and allow it to dry and be discharged on a sieve or grate, and finally to load it into wagons or stow it in boats all in one continuous operation automatically and mechanically, without any hand labor whatever. A diagrammatic view of the apparatus by which this is accomplished is shown in the accompanying drawing.

In front of the coke oven or of a series of ovens, there is at the discharge side of the ovens a tank, *B*, which is filled with water up to its upper edge. At the left end a bridge is built over the tank, leaving the space below it free. At the opposite end the tank has a sloping side. Into this tank is placed the carrier and conveyor, which consists of a strong frame on wheels which run on transverse rails, so that the whole apparatus can be shifted like a wagon crossways in the tank. Strong side beams of plates and bars form the frame of the carrier; crossbars and stays serve to strengthen it laterally. The part of the carrier frame near the oven is built horizontally, and is sunk totally into the water; the other part rises gradually, so that its farther end is quite out of the water and so high that there is sufficient room below it for a sieve or grate at *S*, which may be built in one with the carrier, or it may form a separate part of the apparatus. The sieve or grate may be made with movable bars, or they may be arranged as fixtures. When arranged separately from the transporter frame it may run across the whole width of the tank.



Muller's Coke Quenching and Conveying Machine.

The carrier band consists of two chains, one at the right edge and the other at the left edge; by bolts they are connected laterally, and these bolts form at the same time the axles for the carrier wheels upon which the chains are carried forwards. Plates rivetted or bolted upon the chains and reaching from one side to the other and each of exactly the width of the pitch of the chain links, form together a continuous platform.

The coke coming from the furnace in a hot, glowing state, is pushed directly upon the carrier chain into the tank, when it is quenched and slowly carried forwards; at about half-length it is raised out of the water, and upon the rising part of the carrier chain the water can drop off and the coke is dried, the heat contained in it supporting the drying process, so that it arrives almost quite dry at the end, where it is thrown automatically upon the grate to get freed from ashes and slope down into the wagons.

The transporting band or table moves between two inclined side planks, *V*, which are so fixed to the carrier frame that the plates pass below the lower edge of the planks so that no coke can fall out. The rails or guides for the chain wheels are formed by the channel iron, making part of the carrier frame, its upper horizontal flange carrying the upper chains, the lower horizontal flange carrying the lower or returning chain.

When a coking chamber has been emptied and the cokes from it have been quenched, transported, and loaded, the whole apparatus is shifted sideways before another chamber ready for discharge.

[From *Engineering*.—Continued from page 84.]

American Competition.—No. XVI.

[By President Henry Morton, Ph.D., Stevens Institute of Technology.]

In response to a request for an opinion on the influence of technical education as carried out in the United States, on the competition of this country with others in the world's market, for maufacturers at large, and machinery in particular, I would say, in the first place, that I believe I can best contribute to the general information on this subject by confining myself to matters within my own personal knowledge; that is, to the development of technical education, as illustrated by the work of the Stevens Institute, rather than by attempting to express my ideas or conclusions in general terms.

Thirty years ago, technical education, as we now know it, so far as applied to manufactures, was substantially unknown in this country; and the institution, over which I have had the honor to preside for many years, was among the first established to meet this requirement. The plan and policy adopted in its inception, and continuously carried out and extended up to the present time, were characterized by the following leading idea, namely, to keep the course of instruction—and to that end also the instructors—in close touch with the co-temporary state of the art as it existed in the best workshops.

To effect this, the first faculty of instructors was, as far as possible, selected from men who had personal experience as designers and constructors; and these were aided and encouraged to engage in such professional work as would not interfere with their duties as instructors, but would keep them fully abreast with the practice of the day in commercial establishments.

This was effected by establishing a Department of Tests, to which were referred numerous problems brought for solution in connection with commercial work, such as the testing of new forms of steam engines and other prime motors, of refrigerating machinery, of materials of construction (such as metals and alloys), of lubricants; and, when the development of the dynamo electric machine began, all forms of electric generators and motors.

To enumerate all the subjects which have been treated in our Department of Tests would occupy pages; for it is no exaggeration to say that there are few things of interest to the mechanical engineer which have not passed through our testing department during these 30 years.

The direction and supervision of these tests have always been under the charge of members of our faculty, who have thus not only been kept thoroughly "in line" with the latest "practice," but have become, from the experience thus acquired, recognized "authorities" on many important subjects.

As the Institute has grown, and additions have been made to its faculty, these have been secured from our own graduates, who, besides having the advantages of a training under such instructors as I have described, have had more or less experience in the practical operations of the workshop, as well as from having been employed as assistants in carrying on the work of the Department of Tests.

The above brief statement will give some idea as to the method pursued in selecting and keeping up (or, as I might say by way of illustration, in repair) the intellectual part of our "plant;" and I will next refer to our mode of operation in shaping material for the "product" (mechanical engineers) which we have been turning out.

In this we have had in view the object of giving as large a contact with actual work in the workshops, as was possible within the time limits imposed by other considerations.

To this end, while our workshop course has covered a large range of practical operations executed by the student with his own hands, at the forge, moulder's bench, lathe, planer, milling machine, pattern makers' bench, wood working lathe, and the like, no attempt has been made to carry the work or practice on these lines so far as to secure what may be called manual dexterity, or, in other words, to make the student a competent blacksmith, founder or lathe hand; but, as soon as he had gone far enough to know how the work ought to be done, and the proper handling of tools or adjustment of machinery for doing it, he is passed on to a new operation.

In this way our students are carried over a large field of practical work, and acquire the sort of knowledge of the same which will help them as designers of machinery or superintendents of construction, rather than the special skill in a narrow field which would make them good lathe hands, or smiths, or foundrymen, or pattern makers.

That the training of hand and eye thus imparted has, moreover, been by no means insignificant, has been abundantly shown by the fact that the students who, after two years of the above shop work, are brought into the physical and engineering laboratories, where numerous instruments of delicacy and precision are placed in their hands, manage these with remarkable safety to the instruments, and with an accuracy as to results which has often been a cause of surprise to their instructors.

Again, in the last two years of their curriculum, the students are engaged on the problems of what we have called our experimental course, which to a large extent involve exactly the same sort of work which, as graduates, they will be likely to meet in their professional career.

The character of this work will be most concisely shown by a list of

a few of the problems of this course. Thus it includes, among other things :

Tests of hot air engines, as to fuel consumption, power generated, etc.

Tests of gas engines, as to fuel consumption, power generated, etc.

Tests of air compressors, as to fuel consumption, power generated, etc.

Tests of steam boilers, as to fuel consumption, power generated, etc.

Tests of steam engines, condensing, non-condensing and compound.

Tests of centrifugal fans, jet and displacement blowers.

Tests of ordinary injectors, exhaust ejectors and ejectors.

Tests of pumps.

Tests of steam turbines.

Tests of rotary engines.

Tests of water wheels, Pelton wheel, hydraulic ram.

Measurement of flow of water in pipes, and use of Venturi meter.

Tests of refrigerating machines.

Analysis of chimney gases, and various tests requiring use of pyrometers.

Experiments showing effect of counterweights on the shaking of an engine.

Experiments with belting, run on various kinds of pulleys.

Determination of the centrifugal tension in a belt running at high speed.

A glance at the above list will show that the work included in this course introduces the student to exactly the character of manipulation, and to the use of those instruments and machines, which he is likely to encounter and be required to use in his practical career ; and gives him also such personal familiarity with fundamental processes and structures, as will contribute in the most direct way to his capacity in designing or modifying machines and processes.

It would, therefore, not be unreasonable to expect that a student thus trained should soon become useful to his employers, when he had become familiar with the work carried on in any establishment in which he secured a position as a designer of new or modified struc tures, or by suggesting improvements or economies in metohds.

Actual results have confirmed this expectation, and I could readily relate numerous instances in which the work of our graduates has profoundly modified methods and forms of construction, with the result of contributing important improvements and economies to the manufactures in which they have been engaged.

Though limits of space preclude me from entering into any details on the above subject, which would occupy a large part of *Engineering* if fully developed, I will make one brief quotation which, by reason of the universally recognized ability and success of its author in his selection of men and methods, carries unusual weight.

In a recent letter, in which he announces his intention of devoting $50,000 to the erection of a new building for our engineering laboratory, Mr. Andrew Carnegie says as follows :

"We owe much to Stevens, for many a valuable man has come to us from it."

This testimony might be supplemented by much more of the same kind, but I do not think it needs such support.

But someone might here quote the familiar proverb : "One swallow does not make a summer," and suggest that the "output" of one technical school is too small a cause to account for such an effect as is here considered ; but to this I would reply :

1. That of the 700 graduates who have received the training outlined above, more than 200 are to day in charge of important machine shops, or departments of the same, or in such positions that their judgment is a controlling factor in the mechanical side of the business management : while the vast majority of the remainder are on the road to like situations.

2. That there are now, and have been, many technical schools in this country who have followed more or less closely in our footsteps; and that

3. A number of graduates (in fact, 40) are, and have been for many years, occupying the chairs of mechanical engineering in other technical schools and universities.

In view of the above, I think that I may reasonably pass from the particular to the general, and say that I think it reasonable to believe that technical education in the mechanic arts in this country has exerted a sensible influence on the progress of such arts, in the direction of a world-wide business competition, by reason of the fact that it has been kept in very close touch with the actual daily practice of the workshop ; while at the same time it has not been allowed to lose its educational character, or degenerate into a mere teaching of handicrafts.

As a sort of corollary to the above, the following idea is suggested :

The graduate trained as above, while of course greatly inferior in the results of many years of practical experience such as is possessed by the man who has grown up in the workshop, is, nevertheless, furnished with a considerable amount of preparation to learn quickly when engaged in practical work, so that he acquires the needed amount of such practical knowledge within a few years, or while he is still young enough not to have lost the flexibility of mind and readiness to accept suggestions which are essential to the progressive engineer ; especially when the existing conditions of competition involve the quick appreciation and rapid adaptation of new ideas.

The Iron Situation.

[By Mr. William S. Mattox, in *Iron Age*.]

The question which disturbed the entire iron and steel world this side the Atlantic six months ago, and which crystallized and took form in the title of a paper by so eminent an authority as Archer Brown, "Will it last ?" is not the query which confronts the thinking foundrymen and manufacturers at the opening of the new year. "It" has lasted, and is vitally present to-day. The disquieting note now is, "How will the change come, and what will be the end ?" Prosperity has surprised even the American people. When the first advance was made on Alabama pig iron, months ago, it was accepted abroad, and especially in England, with a cynical and indulgent acquiescence. The usual American boom was predicted. It would last long enough to make a few fortunes, and then break, as many another boom had broken, leaving the industries of the country paralyzed and shorn.

This view was shared by many sagacious men on this side. The advance came so plausibly, with so little ostentation, that we were in the midst of it before we realized its proportions. The country had hardly adjusted itself to the new conditions when predictions were made that the whole thing was ephemeral, and then came fevered discussions as to what caused the change, and as to when the good times would cease. And all this time the country was earning dividends, enlarging natural resources, increasing plants, and raising wages, and every class shared the fruits of prosperity. The recently published Government statistics of the year's export trade alone serve to show what has been achieved.

It was profitless then to urge on the consideration of men whose entire time was taken up in reaping well deserved harvest, the question of the permanency of the state of business. "Take the goods the gods give thee" is a wise philosophy. It is as idle to-day to speculate on the measure of the revenge time will bring for the fat months past and present. Nevertheless, such speculation is epidemic and must needs be handled. Progress is a law of the universe. Only man made ethics provide for retrogression. There is another so called natural law, applicable to physics and often made to serve a purpose in the realm of trade, that the pendulum must swing as far to one side of the perpendicular as to the other. Confidently expecting the backword swing, it is wise to prepare for it, but a better plan would seem to be a perpetuation of existing conditions.

The arguments dealing with oversupply and reduced demand have no weight apparently in the present crisis. This theory has been worn out by discussion till not a shred is left to lay hold of. Ultimately, this will be one of the causes contributing to the decline. Consumption will lapse by degrees till production exceeds it, but such reversal is not to be feared now. The capacity of the country has been tested, and the relative values of supply and demand have been fairly accurately determined. Nearly every furnace down on the lists to be rejuvenated is now in blast. The few remaining cannot possibly alter the facts materially. The country is making pig iron at a greater monthly rate than ever before in its history. And yet the capacity to absorb this sudden increment has correspondingly enlarged. There would appear to be no fear, then, that for a long time to come the iron market will be drugged with a weight that will break it down. Reports show that in New England, as elsewhere, both North and South, business is active ; demand has not decreased. Prices are maintained, and there is a hopefulness and optimism for the future that has hardly been apparent up to now. Only a few days after the holidays and large and small orders are coming to light. Consumers thought to hold back, and by checking the zeal to sell, inferentially they would ease up furnace activity. But this has not been the case, and as users began to see their supplies dwindling to the vanishing point they were forced to buy. Each inquiry of magnitude strengthens the hands of the furnacemen, and the great volume of small orders which filters in every day fills up the gap and makes the case complete.

As a matter of fact it is no more to the interest of the foundryman, and the machine tool maker, and the engineer, and every user of iron, to depreciate prices now, than it is for those furnaces that have struggled along for years and are only now beginning to realize on their investments. A dangerous few say they can make more money on a falling market than on a rising one, but the majority are satisfied with the state of things existing now, and are eager enough to have prices harden where they are. It will necessarily follow that when that slump in raw materials actually comes all branches of allied trades will suffer.

Temporarily, then, one element of expected weakness is disposed of, the fear that we could make more iron than we could use; and it must be remembered in this connection that America's exports of pig iron have been lighter than usual during the last six months. Another source of anxiety was the speculative market. But the country has just risen superior to the threats of a purely speculative panic, and this of itself serves to indicate the solidity of the boom. At any other time such a series of shocks as Wall street and the banking interests of the country have just endured would have knocked the props from under any but the firmest of markets. Here, then, is another menace comfortably shelved. But the query which is in every thought to-day still persists, "From what direction will the blow come, and how far down will it carry the market?" There are those who believe that prices are too high to day, unwarranted by any preceding motive, and that if pig iron could be sent down to $15 a ton, and steel rails and other commodies proportionately, and all held there firmly and permanently, it would be much better. A made to order market could not last. There can be no guarantee, if such a downward move were begun, that any power or combination of interests could check the fall at any one point and hold it there, and no man dares make the attempt. The only recognizable fact of the situation to-day, on the threshold of a new year, is that prosperity is self evident and bids fair to continue. In spite of this the disturbing query conforts one in every counting house, mill and shop, "Where must we look for the influence which will start prices downward, so that we can protect ourselves against it?"

The question is much easier asked than answered, and it might better be left to some bolder or more imaginative mind, or to the slow solution of the problem itself, for final settlement. In the first place, it seems unwise and unnecessary to suppose that the trade revival now on cannot last long. There are no good reasons why to day should not merge into to morrow, and next month, and next year, without bringing any marked change. When the iron trade ceases to worry over what may be, and contents itself with the satisfying facts of the present, much will be done toward preserving the *status quo*. Demand preceded the first advance and was its most natural cause. Demand to day keeps figures where they are. Reports from all over the country show that the prospects for 1900 are better than they were for 1899. Careful estimates of all branches of manufactures put the increase of new business for the coming year at something like 15 to 20 per cent. The tone is cheerful and encouraging, and there is no doubt that more iron will be melted this year than last. In this connection it may be noted that something like 15 furnaces have gone out of blast or been banked during the past fortnight for lack of raw materials, and this will cut off something from the tonnage.

In viewing the question of a continuance of demand, the world's needs in pig iron and in finished iron and steel products must be taken into account, for the markets of the world are so mutually dependent that an abrupt checking of foreign business would affect prices here as quickly as anything else. Here is one source of danger to American markets. Foreign complications, affecting the world's consumption, an unsettled political outlook in the United States, labor troubles, all these are possible causes to be reckoned with as eventually affecting prices. But none of these is so imminent as to cause alarm. There seems to be a general belief that when the reaction comes, it will be sudden and violent, and that prices will touch the famous Birmingham $6 basis by a short cut. This is possible but not probable, and it is more reasonable to believe that the downward move will come as naturally and as gradually as the upward movement, and without jarring the delicate machinery of trade. A gradual diminution of demand will herald the change, and an equivalent lessening of the productive capacity may be effected to meet this by various means at the disposal of makers.

It has already been pointed out in the columns of *The Iron Age* that the first indication of a shading of prices, either voluntary or forced, will not necessarily have the effect of breaking prices, because this will uncover orders which have purposely been held back hoping for just such a change. This very loosening of a few big deals would send prices up again. Large interests, which have not heretofore put in an appearance, would be tempted by a reduction, and the immediate exposure of such big wants would stop any falling tendency. Trade is so nicely balanced; there is so much reserve demand and so much latent energy waiting to be developed, that to predict a decline now is utterly without warrant of fact. Another point, sometimes overlooked, is the fact that, generally speaking, the furnace output is contracted for for the next six months at least. Many furnaces cannot book orders before July or August, and buying is going on at such a rate now that in a few weeks there will be little available iron to dispose of this side of next December. This means that whatever may happen to affect prices the present cannot be robbed of its advantages, and at least another 12 months of prosperity is staring us in the face.

[From *Electricity*. Part II.]

The Future of Electric Illumination.[1]

By Mr. Jean Wetmore.

The war between electricity and gas is much like that between armor plate and guns.

Up to the present time electricity has had the lead, but the late improvements in Welsbach and other burners make the strife more interesting and more evenly balanced.

It is better at this time that electricians have a discussion of the vulnerable features of their systems of illumination and recognize the strong points of their adversaries, that they may make improvements, than to place too much confidence in past successes and ignore the strong points and the recent successes of the gas people.

The object of this article is thus briefly stated.

To carry the lighting agent to the lamps we must have conductors of high priced copper and great conductivity; a No. 14 wire is the smallest size allowed by the Underwriters, with a possible exception for lamp cords and electrolier wire; while for interior work the conductors must be rubber covered and the copper must be tinned to prevent the vulcanized rubber from corroding the wire; then the insulation must be braided or cloth tapped to preserve the rubber from injury by abrasion; then this tinned copper, rubber insulated and braided conductor must be drawn through a conduit of tar soaked paper or other suitable material, and this tube must likewise be protected by an armor, usually an iron tube, to keep the lime from eating the paper, the water from making pulp of it, and destroying the insulation and the sulphurous acid from lessening the conductivity of the wire by corrosion.

This is almost as bad as the benighted Oriental's idea of cosmogony, of the world resting on the back of an elephant, the elephant standing on the back of a turtle, and so on ad infinitum.

Compare all this electrical clap-trap with a plain iron pipe for gas, which for simplicity is unexcelled.

We can not allow of there being a conspiracy between the electrical supply and the manufacturing people, to enrich themselves by increasing the cost of electric installations, by trading on the gullibility of the friends of electrical illumination, for by so doing they would readily perceive that they would finally kill the electrical goose that lays the golden dollars.

It is interesting at this point to review the causes leading up to this complicated and expensive state of affairs.

Briefly stated, the principal cause has been due to a lack of common sense, foresight, and also the incompetency on the part of the electric staff of the various boards of Fire Underwriters.

For a full tenth of a century the writer unceasingly contested for high grades of durable insulation and simplicity of construction, but those in high authority were not willing to let good enough alone, and business houses of high reputation have relegated themselves to mediocrity, and the battle was lost.

Fifteen years ago there were rubber insulations on the market that could be safely buried in concrete or plastered in as permanent fixtures of a building; those insulations would stand water, lime, acids, alkalies, rough usage, heat and cold, and some of our older buildings after fifteen years will show these insulated wires in as good a practical condition as when first installed; but we have no such grade of rubber insulation being installed to-day, and for this reason there are no old rubber boots and shoes lying around.

Good quality and durability in insulation have commercially been sacrificed in general practice to shoddy and cheapness.

Reliable manufacturers traded on the reputation of their products,

1. *Ante*, p. 92.

and deceived their customers for temporary gains, that they might kite stocks, form combinations and by sharp practice skin the confiding foreign investors; thus the result well exemplified in Abraham Lincoln's well known saying, "You may fool all of the people part of the time and part of the people all of the time, but you can't fool all of the people all of the time."

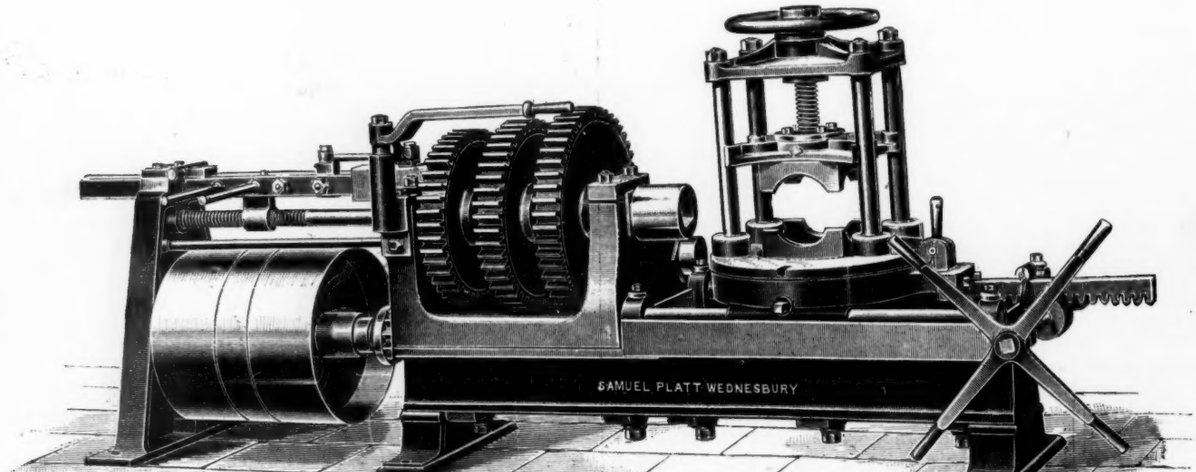
Again the Underwriters have not encouraged the best products or the improvements in the same. They have ever taken the ground of strict impartiality, recognizing no differences, and they made their rules and requirements to guard their own interests against the failings of the worst class of material, and for this reason mainly we are unable to-day in common practice to find a rubber insulation being installed that will resume its original contour when firmly compressed, or will stand reasonable torsion, without breaking, even when fresh from the shop.

The Underwriters demand a certain thickness of material regardless of quality, with a result that our rubber for insulation purposes much resembles a good quality of tenacious baked mud.

[To be Continued.]

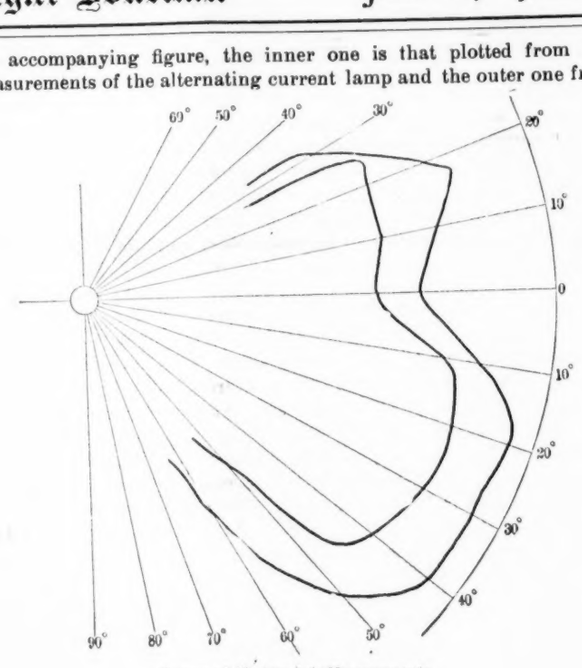
Platt's Automatic Tapping Machine for Pipe Fittings.

The illustration shows a machine, specially designed by Mr. Samuel Platt, of King's Hill Foundry, Wednesbury, England for screwing different sizes of gas and steam fittings, with a minimum of labor and the least possible waste of time. It is specially intended for screwing from 3-inch to 6 inch fittings, and has three different speeds, according to sizes of fittings to be screwed. The fitting is gripped by the top and bottom grips on the turret saddle, the tap being held by the head or chuck with the square hole in it. The turret saddle is moved up to the tap by rack and pinion, and the machine is then started by the lever. The automatic arrangement is previously set so as to reverse and stop the machine when the fitting is screwed, and when the tap has run back clear of the fitting, the catch in the turret is raised and the turret brought round a quarter of a circle, just bringing the next hole in the fitting opposite to the tap. The machine is again started, and the operation repeated until the fitting is screwed in all its holes, when the top grip is raised by the handwheel and screw, and the fitting lifted out of the machine. As the turret saddle moves exactly a quarter of a circle from one catch hole to another, the fittings are, of course, screwed at right angles, this being a special requisite in large fittings.



Relative Candle Powers of Alternating and Direct Current Enclosed Arc Lamps.

In a paper read before the December meeting of the Chicago Electrical Association by Mr. E. P. Warner, on "Alternating Current Arc Lighting," the subject of the relative candle power from direct and alternating current enclosed arcs was discussed at some length. Accompanying the paper was a diagram of curves plotted from photometric measurements taken of an alternating and a direct current lamp, both of the enclosed type. The two lamps were operated under the same voltage, with the same kind of globes and with all the other conditions alike for the two. Of these curves, which are shown in the accompanying figure, the inner one is that plotted from the measurements of the alternating current lamp and the outer one from those of the direct current lamp. It will be noted that while the direct current lamp exceeds the alternating current in light capacity by an average of about 12 per cent., there is a remarkable similarity with respect to distribution. The tests were made purely with a view to determining the relative intensity, and the curves do not show actual candle power.



Curves of Photometric Measurements.

Mr. Warner referred to the difficulty in making photometric measurements of arc lamps, especially of the enclosed arc. The alternating arc continually shifts from place to place, which results in enormous changes in the intensity of the light. When the arc is upon one side of the carbons, the light emitted from the opposite side is comparatively weak, and for about 5° above and below the horizontal plane it is very strongly violet, while upon the side where the arc is located the light is quite intense and white in color. It becomes necessary, therefore, in making the photometric tests of this arc to secure a large number of measurements and take the mean in order to arrive at anything like a safe average.

This peculiarity of having a violet band upon one side and a bright light upon the other seems to be more a characteristic of the alternating than of the direct current enclosed arc lamp. It is true that the arc of the direct current lamp shifts about very considerably, and that when it is upon one side there is a considerable shadow from the carbons upon the other side and a marked diminution of light; and the same precautions had to be taken in measurements of light intensity with this lamp as with the alternating. It was found, however, that a safe average could be obtained with a considerable smaller number of measurements than with the alternating.

Mr. Warner said that in the application of reflectors on the alternating lamps the results he had obtained are not particularly encouraging. While there is unquestionably some advantage to be gained by their use, there are numerous difficulties in the way of using effective reflectors, and such reflectors as are found suitable for use and practical have not been found very effective. In the measurements of relative light intensity given in the diagram, the alternating lamp was supplied with a metal reflector, white enameled on the under side, while the direct current lamp had no reflector. It will be noted that notwithstanding this fact, the light intensity in the upper portion of the curve from the direct current lamp is considerably greater than that from the alternating.

In order to correct the violet rays in the alternating lamp and make it acceptable for commercial lighting, Mr. Warner has used what is known as an alabaster globe. This globe is composed of two layers or thicknesses of glass, one of which is clear or slightly tinted with uranium, and the other opalescent. The combination of these two acts upon the violet rays almost the same as an aqueous solution of quinine sulphate; and transforms the violet into white light. This result is not effected, however, without a material loss in the intensity of the light, but it has been found in practice to be a necessary sacrifice, as in almost all instances a proper color of light is demanded irrespective of the power.

Recent claims relating to alternating arc lamps in series arc lighting were referred to as somewhat over enthusiastic in the matter of light distribution and the fogging or clouding of the globe by deposits from the arc. He considers that the deposit upon the interior of the enclosing globe is somewhat greater from the alternating arc than from the direct current, and begins to form considerably sooner after the light is started. This he believes to be due to the fact that cored carbons are used in the alternating lamps, as when an alternating lamp is operated with solid carbons there seems to be no more deposit than if the current were direct. However, the advantages gained by the use of cored carbons in the alternating lamp are such as to more than offset the objection.

Failures in Asphalt Pavements.

Captain Lansing H. Beach, Engineering Commissioner for the District of Columbia, has handed in his report for the year to the Commissioners, respecting the operations of his department for the period under review. An important chapter in the report relates to "Failures in Asphalt Pavements;" and one of its sections, entitled "Disintegration of Pavements in Spots," will be studied with interest by our readers. This part of the report, which was prepared by Mr. A. W. Dow, Inspector of Asphalts and Cements, is as follows:

As there are several causes, all foreign to each other, for the disintegration of pavements in spots, it will be impossible to discuss them as a whole.

When a pavement is laid with a surface mixture deficient in asphalt cement and the asphalt cement is so hard as to be very brittle in cold weather the pavement will be ground away by traffic, and as there are always spots weaker than others the disintegration will naturally take place more rapidly in these places. Such a pavement will disintegrate more rapidly in cold weather, and is also likely to crack badly at the same time.

There are cases of disintegration in spots occasionally met with that are caused by a rolling or softening of the asphalt surface by oils coming from the binder. This occurs most frequently in pavements laid with coal tar binders, as there appears to be a constituent of some coal tars which is readily absorbed by the surface mixture, softening it greatly and apparently making it more susceptible to the action of water. Pavements affected this way first give signs of their disintegration by a slight depression over the affected spots. In time numbers of small cracks appear, running parallel with the street. These gradually increase in prominence, accompanied with transverse cracks, until the pavement has the appearance of alligator skin. On examining a section of the surface mixture cut from the affected spot it will be found to be quite soft near the binder if the disintegration has not proceeded for a length of time; if older, the soft zone will be nearer the surface, while the bottom of the mixture will show the disintegrating effect of the water that has likely entered the pavement through the crack. The affected piece of mixture will smell strongly of coal tar, and will, in all cases, give a greenish fluorescence to a solution in carbon disulphide. The portion of the pavement thus acted on will be crowded or worn out by traffic until nothing is left of it. If the surface mixture is soft, the pavement will roll at this place, the soft affected material crowding before the traffic. Binder made with asphalt cement in some few cases affects the surface mixture in this way. It is likely caused by the presence of some free oils which may not have been properly incorporated with the asphalt in making the binder cement.

There are several streets in the city being ruined by the absorption of illuminating gas escaping from leaky gas pipes or mains under the pavement, and it appears to be a common thing in all cities having gas. The pavements are affected in very much the same way as when disintegrated by coal tar binder, except the fine cracks, running parallel with the streets, make their appearance some time before the pavement begins to crowd. Pieces of the surface mixture taken up smell very strongly of illuminating gas, and in some cases the gas can be ignited by applying a match to the under surface when it has just been taken up. In nearly every case enough gas will be given off by heating a small piece of the affected pavement in a tube to have it flash by igniting.

As it has been doubted by some that this disintegration is really due to illuminating gas, a thorough investigation of the subject has been made. Samples of pavements were obtained from several affected spots, and in all cases it has been possible to obtain from them a gas that exploded by passing an electric spark after mixing with air. The method employed to obtain the gas from samples of the surface mixture was by heating them under boiling water and collecting the gas given off in an inverted funnel. Those not acquainted with the properties of asphalts might suggest that heating any asphalt to this temperature might make it give off a gas. This is impossible, as an asphalt cement such as is used in paving will lose only 3 or 4 per cent., at the most, on being kept at a temperature of 400° F. for 30 hours, and only an infinitesimal part of this loss is a gas at ordinary temperatures. To make a more practical demonstration of this, two samples of a pavement were taken, one from an affected spot and the other from a good portion of the pavement about 10 feet away. These samples were treated under boiling water until they ceased to evolve gas. The affected sample gave several times more gas than did the other. On testing, the gas from the good sample was found to consist of oxygen and nitrogen, which was evidently just the air from the voids of the pavement. The gas from the affected piece gave on analysis the composition marked "pavement" in the accompanying table. This cannot be a natural or marsh gas, for there is no analysis of such gases on record that contains appreciable amounts of heavy hydrocarbons, while the gas from the pavement is rich in these compounds. The same would also apply to sewer gas. The only remaining source is illuminating gas, the analysis of which is also given.

Analyses of Gases, Percentages.

	Pavement.	Illuminating.	Asphalt.
Carbon dioxide	8.4	0.2	0.1
Oxygen	10.8	....	....
Heavy hydrocarbons	13.4	12.1	1.2
Carbon monoxide	0.7	25.5	21.3
Hydrogen	6.6	39.2	42.2
Methane	2.0	23.0	23.2
Nitrogen	58.1	....	....

On comparing the composition of the gas given off from the disintegrating pavement with the illuminating gas, it is seen that they are not at all similar in composition. At first glance it would not seem possible that the former gas could originate from the latter, but when the properties of asphalt are considered it is easily explained.

Heavy hydrocarbons, to which class asphalts belong, are known to absorb other gaseous hydrocarbons; the heavier the gas the more affinity between it and the heavy hydrocarbons. Knowing this, the ingredients of the illuminating gas that asphalt would have the greatest affinity for would be the heavy hydrocarbon gases, a slight affinity for the marsh gas or methane, and no affinity for any of the other ingredients. If we examine the ingredients of the gas from the affected pavement, it will be found to consist of some carbon dioxide, air that was in the voids and cracks of the pavement, and the constituents of illuminating gas with the heavy hydrocarbon gases very much in excess, which is what we would expect. To practically demonstrate that the above takes place when asphalt is in contact with illuminating gas, two samples of gas were taken from a tap in the laboratory. One was analyzed, while the other was kept for several week in a tube, the interior of which was coated with asphalt cement such as is used in pavements, after which it was analyzed. The results of the analyses are given in the table.

It is evident from this that the asphalt cement has absorbed over 5 per cent. of the heavy hydrocarbon gases, a little methane, and practically nothing else. One part by volume of asphalt cement will absorb

forty-two parts of illuminating gas in somewhat over a month. Asphalt is much softened by absorbing gas, the ordinary asphalt cement becoming as soft as a thick maltha after being in an atmosphere of illuminating gas for several months. As to the quantity of gas contained in the affected pavements, this, of course, varies; but in one instance 1,000 cubic centimeters of pavement gave off 500 cubic centimeters of gas.

There is but one way to stop the disintegration of a pavement from this cause, and that is to stop the leak of gas, for it is useless to patch the pavement, as it will not be long before the patch disintegrates. There have been cases where a pavement so affected was repaired, and in fourteen months the patches were showing signs of disintegration.

Disintegration by water entering a pavement by oozing up through the base will probably be found one of the most common, especially in small towns and cities where there are no terraces or considerable lawns in front of houses. There have been a number of cases in this city where the water has entered a terrace or parking where they were above the grade of the street and worked its way up the concrete base to the asphalt surface. This disintegration manifests itself differently, depending on the character of the pavement. If the asphalt surface is soft or the concrete smooth, the first defect noticed will be the tendency of the pavement to crowd in warm weather. This is due to the under portion of the surface mixture rotting, so to speak, thus destroying the cementing properties of the asphalt. The upper portion, although good, being deprived of the support of the affected mixture under it, will be crowded out by traffic. This crowding is assisted by the concrete base being smooth, and also the bond between the base and binder is destroyed by the moisture.

In cases where the concrete base is rough and the surface mixture hard, the principal disintegration will take place in cold weather, nothing abnormal being noticed untill the pavement begins a rapid crumbling away in the affected part under traffic.

On examining a section of asphalt surface disintegrating from this cause, especially where it has not been going on for too long a time, there will be found a layer of perfectly sound and good material at the surface of the pavement, while underneath the mixture will show evidence of being disintegrated by water—that is, the sand will appear clean and white in spots, as though there had been an insufficiency of asphalt cement to cover it. The concrete base under the affected pavement will generally be found damp or even wet. The destruction of several pavements from this cause has been prevented by the use of blind drains put in under the gutter next to the lawn or terrace, and even run herring bone under the pavement. This last cause for disintegration would, of course, not occur in a pavement constructed with an asphalt that was unacted on by water, but water soaking up through a concrete base might injure any pavement by freezing.

It is always advisable where a pavement shows sighs of disintegrating to examine into the cause in a most careful manner and not pass snap judgment. It seems only too easy for the majority of people, whether experienced or not, to place the blame for the failure of a pavement on the manufacturers. Men with considerable experience, commenting on a bad place in a pavement that they had not carefully examined, have said: "They used bad oil or asphalt in that piece of work." They have not taken into consideration that all but possibly a square yard of the pavement is in good condition, and that it would be no economy to a contractor to use bad material in one small place of the pavement. A careful examination into the disintegrating of a pavement may, in many cases, show a cause that is entirely foreign to the composition of the materials and a cause that could be easily remedied with a little common sense.

Direct Alternating Generators for Coal Mines.

Mr. Alton D. Adams, writing in *Mines and Minerals*, says that the kinds of work to which electric energy may be readily applied in mines come mainly under the heads of lighting, hauling, pumping, ventilating, cutting, and drilling. The incandescent lamp is now generally recognized as superior to all others for coal mine work, because of its lighting power, safety, and freedom from combustion products. Either direct or alternating current may be employed for mine lighting with about equal advantages for the average case. Lamps for operation at pressures from 220 to 250 volts are now regularly offered by manufacturers, and it will usually be to the decided advantage of mine operation to use lamps of about these pressures. If direct current supply is used for lamps, they should be connected on the three wire system, so as to give pressures of from 450 to 500 volts between the outside wires. As pressures of about 500 volts are in common use for haulage systems, power for both lighting and traction purposes may thus be supplied by the same generators. It will usually be much better to run independent circuits from the generator for lighting and traction work, as when the current for both is drawn from the same wires, the heavy and variable traction loads produce changing losses of pressure in the conductors and, therefore, fluctuating voltage and unsteady light at the lamps.

When the lamps are operated from alternating current circuits i will be found better in many cases to avoid the use of transformers and employ lamps of about 220 volts as in the direct current supply. So far as lighting is concerned, there is, therefore, little or no choice between the use of alternating and direct current systems, unless the radius of operation is so great as to require a high pressure service, with transformers, in order to keep the outlay for conductors within reasonable limits. It should be held in mind, however, that the depreciation of copper couductors is much slower than that of transformers, so that, all things being equal as to results of operation, it is better to invest a given sum in conductors alone than in conductors and transformers.

As no satisfactory car motors are to be had for use with alternating currents, mine hauling with electric power can only be done from direct current supply. The superiority of electric traction over all other methods, in mines, is so marked that the electric car bids fair to cover the entire field of mine haulage.

Pumping is one of the most important operations connected with mines, and apparatus for this work must be of the most reliable character. The hard exposure and slight care to which the pumping machinery in mines is subject, make this work especially trying to direct current motors, the commutator and brushes being a frequent seat of trouble. Polyphase motors, with their entire absence of sliding contacts, that may either interrupt operation or cause sparks, when out of order, are an ideal source of power for mine pumps, and they are rapidly coming into use to displace steam for the purpose.

The polyphase motors are also especially adapted to drive ventilating fans and do various other work at those points in mines whose exposed locations would be apt to cause trouble with direct current motors. For coal cutting, either direct or alternating current motors may be used, and either will give good results under fair treatment. Electric drills require the polyphase current, and they are gradually being introduced in place of those operated with steam or compressed air.

The above brief glance at the requirements of electric mining machinery shows that both the alternating and direct currents are necessary in mines having a complete electric equipment, and that both are desirable for mines where any work, aside from lighting and traction, is done by electric current.

As the 220-volt lamp has been very little, if any, used in mines thus far, a third kind of current, that at high pressure for lighting with transformers has been met in some cases. The practical result of these diverse requirements as to current is found in the installation of two and sometimes three sorts of generator mine power stations. These equipments include direct-current generators at about 500 volts, for traction single-phase alternating current of 1,000 or 2,000 volts, with transformers for lighting, and polyphase alternating currents at, usually, about 500 volts, for electric drills, pumps, and other motor purposes. This combination of diverse units is one of the kind that central stations in town and cities have long been afflicted with and from which they are just beginning to emerge. The main objections to this diversity of station units are those relating to efficiency, labor of attention, floor space, first cost and reliability. It may be assumed that the question of efficiency is of minor moment to the operators of a coal mine, but all of the other objections to a diversity in electric-generator equipments have about the same force for mine plants as for the public supply stations.

The ideal generating equipment is evidently that in which all of the units are of the same kind, and each unit can supply current to any of the operated devices. For a given number and capacity of generators, the greatest reliability is obviously obtained when either machine can do the work of the others, up to the limit of its capacity. The development of central stations for public supply is rapidly tending to uniformity as to size and particularly as to character of the main generating units, and a change in the same direction will prove of decided advantage in mining plants. In city stations, a variety of factors operate to determine the type of electric generator best suited to each particular case, and no one kind of machine can be held best for all places.

Quite a large class of important public plants, however, are so situated as to load and location that they, like mining stations, must furnish

polyphase alternating current to one part of their load and direct current to another. For this class of plants, as for those at coal mines, the best possible equipment is that of generators, each of which is suited to deliver both direct and alternating current, or what may be called direct alternating generators. Each generator of this sort can supply either direct or alternating current to its full capacity, or any part of its capacity in either form of current, and the remaining capacity in the other form of current at the same time. A generator of this type is supplied with both a commutator and a set of collecting rings, connected to the same armature winding. The commutator, of course, delivers direct current and the construction may readily be such as to provide alternating current of two, three or more phases, as desired, at the collector rings.

Generators of this sort may be connected in simple multiple or on the 3-wire system as to their commutators for traction and incandescent lamps, and the current from their collector rings used in polyphase motors, electric drills or lamps, as desired. While the equipment necessary in coal mines has been held particularly in view in this discussion, direct alternating generators are well suited to the conditions of other mining work.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AT the annual meeting of the shareholders in the Rockville (Conn.) Gas and Electric Company, the retiring officials were complimented for their efforts in 1899, as shown by the accounts submitted, and through an inspection of the plants as made by the shareholders prior to the annual election. Secretary and General Manager Burritt, who is of the modest order, must have experienced some chest expansion while listening to the remarks of the proprietors. The officers elected were: President, A. M. Young, of New York; Vice President, George E. Terry, of Waterbury, Conn.; Treasurer, F. W. Marsh, of Bridgeport, Conn.; Secretary and General Manager, Dwight F. Burritt.

THE proprietors of the Louisville Gas Company have declared a semi-annual dividend of 2½ per cent, payable to shareholders of record on the 1st inst.

THE proprietors of the Chicopee (Mass.) Gas Light Company were before the Board of Gas and Electric Light Commissioners for the right to increase its capital stock to $100,000, from $75,000. Mr. Luther White represented the Company during the argument. There were no remonstrants. The bonded indebtedness of the Company is $60,000. We understand that Mr. H. Allen Odell's connection with the Company has ceased completely.

AT the annual meeting of the shareholders of the Winsted Gas Company, of West Winsted, Conn., no change was made in the executive management. It was voted to expend a considerable sum in plant renewal and enlargement.

AT the annual meeting of the Peoples Gas Light Company, of Cleveland, Ohio, the following officers were chosen: Directors, John M. Carrington, Charles H. Beardslee, George H. Warmington, Daniel D. Warmington and M. A. Bradley. The latter takes the place of the late Mr. John F. Rust.

TO-DAY the shareholders of the New Bedford (Mass.) Gas and Edison Electric Light Company will consider a proposition to increase the capital stock in the sum of $100,000; from $550,000 to $650,000. The objects of the new capital are: The placing of an underground conduit system and the improving of the Company's coal gas plant.

A PARTY named Frank E. Stover has been granted the right to lay gas mains in the town of Luray, Va., through which mains he proposes to distribute gas of the acetylene variety. Luray was always noted for its love of the mysterious.

IT is now pretty well understood that the proprietors of the Northwestern Gas Light and Coke Company, which operates in Evanston, North Evanston, South Evanston and Willmette, Ills., have purchased the plant and rights of the Kenilworth Gas Company. If this is so, Mr. Rufus C. Dawes has made good his claim that he would secure in a short time complete control of the gas supply of the North Shore of Lake Michigan, in Cook county, Ills.

AT the annual meeting of the proprietors of the Dover (N. H.) Gas Company these officers were chosen: Directors, John F. Hill, William T. Cobb, Arthur L. Bates, J. F. Lang and Geo. V. Severance; President, John F. Hill; Treasurer, J. F. Lang; Clerk, T. B. Garland.

THE Chicago *Inter-Ocean* says that Mr. E. G. Cowdery, representing Milwaukee (Wis.) capitalists, is negotioting for the purchase of the properties of the Waukegan (Ills.) Electric Light Company, with a view to consolidating the same with the properties of the Waukegan Gas Light and Fuel Company. This suggestion does not seem likely to come to pass, for the gas interests of Evanston would seem to be the "natural" acquirers of the Waukegan gas plant, should the owners of the latter be disposed to part with their property.

P. H. GRAVES & SON, furniture dealers in Waltham, Mass., have been illuminating their shops with acetylene gas. It is fair to presume they regret their forwardness from a lighting point of view, because an explosion of acetylene gas, which happened on their premises the night of January 10th, did considerable damage.

MR. W. F. DOUTHIRT, Secretary of the Columbus (O.) Gas Light and Heating Company, has notified the shareholders that a dividend of 2 per cent. on the common stock is payable the 2d prox.

THE newspapers of Binghamton, N. Y., report the election, at the annual meeting, December 15th, 1899, of Mr. Fred. B. Wheeler, General Manager of the Binghamton Gas Works, as a Director of the Strong State Bank. This bank is one of the most influential and hustling financial houses in the South Tier counties.

THE Detroit *Free Press* says that the promoters of the proposed Peoples Gas Company for Detroit are resting on their oars, awaiting a slump in the prices of iron and other material. It was expected that with the advent of a new Common Council another attempt would be made to secure a gas franchise for competition with the Detroit City Gas Company. Some days ago one of the men interested in the projected Peoples Gas Company said to a *Free Press* representative: "It now looks as though we shall not try to secure a new gas franchise, before spring anyway. The price of material is too high."

THE Sussex County (N. J.) Gas Company has been incorporated. It is capitalized in $75,000.

AT a meeting of the proprietors of the Camden (N. J.) Gas Light Company, Messrs. Richard F. Smith and Benjamin F. Archer resigned as Directors. Judge E. Ambler Armstrong was elected to fill one of the vacancies, and these gentlemen were also named on the Board: John McIlhenny, Charles Watson and Samuel C. Cooper. There still remains a vacancy on the Board which will in due time be filled by its other members. Mr. Joseph C. Lee was elected Clerk to the Board, succeeding Mr. George Archer, resigned.

"AT the annual meeting of the Consumers Gas Company, of Woodbury, N. J., the Directors chosen were: H. C. Clark, G. G. Green, M. W. Newton, C. C. Jessup, C. R. Ogden, C. W. Starr, Lewis Starr, H. S. Talman, H. H. Clark, A. J. Rice, E. P. Bradway, D. O. Watkins and G. W. Curtis. The Directors subsequently named the following officers: President, H C. Clark; Vice-President, G. G. Green; Secretary and Treasurer, C. W. Starr; Superintendent, G. W. Curtis. A dividend of $1.50 per share was declared, and a resolution to reduce the gas rate from $1.65 per 1,000 to $1.50 per 1,000, the concession to date from March 1st, was adopted.—T. R."

AT the annual meeting of the Danville (Ky.) Gas Company no change was made in the executive management. A dividend of 4 per cent. was declared. The Company is preparing to open up a handsome business office on Fourth street. A show room for improved gas appliances will be a feature of the new establishment.

THE Boston *Post*, of the 5th inst., had this to say about the 75 cent gas bill proposed for Boston by Representative Engstrom: "Representative Charles O. Engstrom, of Ward 22, who has introduced a bill calling for 75 cent gas in Boston, was seen yesterday by a *Post* reporter in regard to the proposed legislation and gave his views regarding the measure. Mr. Engstrom said: 'This bill was introduced by me at the request of numerous citizens of my ward and citizens of other parts of Boston. At the present I am devoting considerable time to the investigation of the subject. I fully believe that the Gas Companies doing business in Boston can furnish gas profitably to consumers at the price named in the bill, namely, 75 cents per 1,000 cubic feet. It will be noticed that even this price is 15 cents higher per 1,000 cubic feet than the price promised some years ago. The finances of the Gas Companies' business have been conducted in such obscurity from the time the great combination of the Boston Gas Companies began, that it

is apparent the people will not get what they are entitled to in this matter without the assistance of the Legislature. I think the people are willing that there should be a fair return upon all capital properly invested in the production and distribution of gas, but the people should not be made to pay dividends on fictitious capital and watered stock. This bill will make it possible for the fulfilment of the promise given to the Massachusetts Legislature by a Company that it would furnish gas for 60 cents per 1,000 cubic feet. I shall do all in my power to have this matter clearly and thoroughly presented to the Legislature, so that no doubts may be left but that gas can be manufactured and sold to the consumer at the price named in my bill, and still leave a fair profit upon capital honestly invested.'"

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Sec. 10. The said grantees, their successors or assigns, shall not charge nor receive any higher rates than the following for gas furnished within the city limits of the said City of Sault de Ste. Marie, to wit: The sum of $1.75 per thousand cubic feet for illuminating purposes, and $1.50 per thousand cubic feet for fuel purposes; there shall, however, in all cases be charged the sum of 25 cents when the consumption is less than 100 feet per month. Prepayment meters may be used by said grantees, their successors or assigns, whenever they shall so choose.

THE Consolidated Gas Company, of Pittsburg, Pa., has declared a regular semi-annual dividend on its preferred stock of 3 per cent. It is payable February 1st.

WE are told that "Mr. A. L. Fennessy, of New York," is the gentleman who is anxious to establish a gas works at Dover, N.J. His chances in Dover are not quite good as they were in Bergen county, N. J. He at one time owned the works at Rutherford, N. J., which he purchased from Mr. B. van Steenbergh.

AT the annual meeting of the Newport (R. I.) Gas Light Company the officers chosen were: Directors, Henry Bull, Jr., Andrew K. Quinn, Frederick Tompkins, T. A. Lawton and Melville Bull; President, Melville Bull; Treasurer, Andrew K. Quinn.

SUPT. DOLE is satisfied that the new business offices of the Bangor (Me.) Gas Light Company will lack nothing in commodiousness or beauty, should any seek to compare them with other premises of like nature in busy Bangor.

THE Directors of the Waynesboro (Pa.) Gas Company have named the following executive management: President, Dr. J. C. Criswell; Treasurer, J. H. Stoner; Secretary, J. B. B. Smith.

THE following is from the Philadelphia *Ledger*, dated the 16th inst.: "It was stated yesterday by Mr. Paul, counsel for William G. Fox and Mary E. Fox, his wife, that the suit against the United Gas Improvement Company and contractor George F. Murray for damages on account of injuries sustained by Mrs. Fox through the alleged negligence of the defendants, would be fought through the higher courts. The case is interesting to residents of the city in general, for the reason that it brought out the fact that there appears to be no law that requires obstructions on the sidewalks to be marked by red lights or otherwise. The case was tried last week in Court of Common Pleas No. 1, before Judge Beitler. The plaintiffs sued for $15,000 damages, and a verdict was rendered for the defence. From the testimony adduced it appears that Mrs. Fox, on the evening of March 31, last year, fell over some boards laid around a lamp post in front of 2123 North 11th street, and suffered injuries of the back. Mr. Murray, who was employed by the U. G. I. Company, under contract, had planted a lamp post at that place, and upon replacing the cement sidewalk around the post had laid boards over it to protect the soft cement, and had placed no red light or other signal to warn pedestrains of the obstruction. The defence showed that there was plenty of clear space for pedestrains to pass, and that the lamp was lighted; also that other persons, including some of the witnesses for the plaintiff, who testified to seeing her when she fell, also saw the boards upon which she had fallen from some distance. The Judge's charge to the jury touched upon the obligation of persons walking on the sidewalks to exercise care and caution. 'Negligence, under the law,' he said, 'is the failure to do something that under the circumstances a reasonably cautious and prudent man ought to do, or the doing of something which a reasonably cautious and prudent man ought not to do." He decided that, as Murray had taken the contract to do the work for the Company, and assumed all responsibility for accidents, the Company could not be held liable, though counsel for the plaintiff argued that the gas lease provided that the Company alone should be responsible, and not any of its contractors, Judge Beitler said that the provision quoted only required the Company to save the city from damages. The jury, after considering the case for some time, returned to the court room, and the foreman asked the Judge: 'Ought there to have been a red light other than what was there? Is there any law requiring a red light to be placee there?" Judge Beitler replied: 'There is no law providing that red lights shall be placed upon openings or places of that sort. It is a question for you to decide what the defendant ought to have done. If he did not do all that he ought to have done, you are entitled to draw the inference of negligence. You must decide what a reasonably cautious and prudent man ought to have done that night and at that place. There is no law, however, providing for the maintenance of red lights over obstructions. While we see them frequently, it is simply the care that the people who put them there take to prevent accidents. There is no law that I know of that requires them to be put on.' It would appear from an examination of the digest of our laws and ordinances relating to the city that the only regulation on the subject of red lights is the ordinance of Councils of June 7, 1872, which provides: 'That all contractors, owners or occupants of buildings or others placing building materials of any kind or any other obstructions or excavations upon or across the cartway of any public thoroughfares in this city, shall place and keep thereon from sunset to sunrise a lighted lantern of red glass, and wherever such obstructions or excavations exceed 10 feet in length or breadth, one such lantern shall be placed upon each end thereof.'"

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
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PACIFIC COAST GAS ASSOCIATION.

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AGENTS:
New York—American News Co. 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JAN. 22, 1900.

The Market for Gas Securities.

A restricted market and rumors of discontent in the shareholding ranks of the Consolidated Company caused the latter to sell well below 190 last week. The close to-day (Friday) was 187 to 188. George Alfred Lamb's circular asking that disgruntled shareholders should be present at the annual meeting to-day of the Consolidated is a trifle on the display order. It certainty brought money in the way of advertising to the newspapers, and it and his antics will have no effect whatever on the management of the Company, who are in every sense inclined to and are capable of doing complete justice to every shareholder. It is our belief that at the meeting enough of the purposes of the Company will be divulged to send Consolidated up several points. The dirty mess in the Standard deal is not only messy but ridiculous. Standard common is reported at 95 to 115. Amsterdams are weaker.

Outside shares are generally strong, especially in respect of United Gas Improvement Company, which advanced sharply on the news that the Company's capital was to be increased in the sum of 50 per cent.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks,

16 WALL STREET, NEW YORK CITY.

JAN. 22.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	187	188
Central Union, Bonds, 5's.	3,000,000	1,000	107½	108½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	18
Metropolitan Bonds	658,000	.	108	112
Mutual	3,500,000	100	300	305
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.	13,000,000	100	22	23
Preferred	10,000,000	100	46	48
Bonds, 5's	11,000,000	1,000	94	95
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River				
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	95	..
Preferred	5,000,000	100	125	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	110	114
Yonkers	299,65	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	143	145
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1⅛	1⅝
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	40	..
" 1st Mtg. 5's	475,000	1,000	96½	99½
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	71
Buffalo City Gas Co.	5,500,000	100	9	11
" " Bonds, 5's	5,250,000	1,000	84	85
Central, San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,207,000	1,000	106	108
Columbus (O.) Gas Lt. & Heating Co	1,682,780	100	60	65
Preferred	3,026,500	100	84	86
Consumers. Jersey City Bonds	600,090	1,000	102	105
Cincinnati G. & C. Co.	8,500,000	100	193½	194½
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	53¾	54
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	380,000	1,000	87	90
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,560,000	50	95¾	96
" Prior Lien 5's	4,598,000	1,000	99½	100
Detroit Gas Co., 5's	386,000	1,000	100	101
" Inc. 5's	16,000	100	100½	101
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds	2,000,000	..	80	85
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	220
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	102	105
Indianapolis	2,000,000	..	122	128
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co.	250,000	50	72	78
" 1st Mtg. 5's	250,000	1,000	101	102½
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	
Laclede, St. Louis	7,500,000	100	79	80
Preferred	2,500,000	100	95	100
Bonds	10,000,000	1,000	107	
Madison Gas & Elec. Co.	400,000	100	82	
" 1st Mtg. 6's	350,000	1,000	102½	108
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	16,000,000	..	50	60
Bonds, 6's	4,600,000	..	107	108
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	43	45
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	103½	103¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111⅛	111½x
2d "	2,500,000	1,000	104	105
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	49	50
St. Paul Gas Light Co.	1,500,000	100	57½	58½
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	88	90½
St. Joseph Gas Co.	1,000,000	100	42	44
" 1st Mtg. 5's	750,000	1,000	96½	98
Syracuse, N. Y.	1,750,000	100	15½	18
Bonds	1,612 000	1,000	81	84
Washington, D. C	2,000,000	20	285	..
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	106¾	107¾
Bonds, 5's	3,880,500	.	106	108
Wilmington, Del.	600,000		220	50

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MESSRS. Walter J. Hunsaker, Chase S. Osborn, Otto Fowle and others are attempting to secure a franchise for the right to construct and operate a gas works in Sault de Ste. Marie, Chippewa County, Mich. In 1898, Peter, Primeau and others of Marquette, Mich., were granted a franchise to supply gas in Sault de Ste. Marie, but the right expired through the failure of the grantees to conform to the franchise stipulation. The main features in the Hunsaker-Osborn proposition are:

Sec. 9. The gas to be furnished by said grantees, their successors or assigns, for illuminating purposes, under the terms and upon the conditions prescribed in this ordinance, shall be a good merchantable gas, the illuminating power of which shall equal at least 16 candle power, when measured by any standard burner consuming 5 cubic feet per hour; that the gas shall be of a standard and purity such as is required by the laws of the State of Massachusetts, viz. Minimum candle power, 16; maximum grains of sulphur per 100 cubic feet of gas, 20; maximum grains of ammonia per 100 feet of gas, 10; sulphureted hydrogen, none allowed. If the average of any month's test shall fall below 16 candle power as herein provided, then the amount to be charged by said grantees, their successors or assigns, for such gas furnished to consumers during said month shall be reduced pro rata, and said gas shall be delivered at the burner of the consumer at such pressure in the mains as shall be consistent with the proper distribution of the same throughout the entire system in the said City of Sault de Ste. Marie; and the degree of such pressure shall be always proper and reasonable and at all times subject to the inspection and approval of the Common Council or the Board of Public Works of the said City of Sault de Ste. Marie. All meters, governors and apparatus shall be subject at all times to inspection by the proper officer of said City of Sault de Ste. Marie. There shall be maintained at the Company's office a photometer and a pressure gauge, both of which shall be subject at all times to the inspection of all gas consumers, the Mayor, City Clerk and any member of the Common Council or Board of Public Works of said city.

Sec. 10. The said grantees, their successors or assigns, shall not charge nor receive any higher rates than the following for gas furnished within the city limits of the said City of Sault de Ste. Marie, to wit: The sum of $1.75 per thousand cubic feet for illuminating purposes, and $1.50 per thousand cubic feet for fuel purposes; there shall, however, in all cases be charged the sum of 25 cents when the consumption is less than 100 feet per month. Prepayment meters may be used by said grantees, their successors or assigns, whenever they shall so choose.

THE Consolidated Gas Company, of Pittsburg, Pa., has declared a regular semi-annual dividend on its preferred stock of 3 per cent. It is payable February 1st.

WE are told that "Mr. A. L. Fennessy, of New York," is the gentleman who is anxious to establish a gas works at Dover, N.J. His chances in Dover are not quite good as they were in Bergen county, N. J. He at one time owned the works at Rutherford, N. J., which he purchased from Mr. B. van Steenbergh.

AT the annual meeting of the Newport (R. I.) Gas Light Company the officers chosen were: Directors, Henry Bull, Jr., Andrew K. Quinn, Frederick Tompkins, T. A. Lawton and Melville Bull; President, Melville Bull; Treasurer, Andrew K. Quinn.

SUPT. DOLE is satisfied that the new business offices of the Bangor (Me.) Gas Light Company will lack nothing in commodiousness or beauty, should any seek to compare them with other premises of like nature in busy Bangor.

THE Directors of the Waynesboro (Pa.) Gas Company have named the following executive management: President, Dr. J. C. Criswell; Treasurer, J. H. Stoner; Secretary, J. B. B. Smith.

THE following is from the Philadelphia *Ledger*, dated the 16th inst.: "It was stated yesterday by Mr. Paul, counsel for William G. Fox and Mary E. Fox, his wife, that the suit against the United Gas Improvement Company and contractor George F. Murray for damages on account of injuries sustained by Mrs. Fox through the alleged negligence of the defendants, would be fought through the higher courts. The case is interesting to residents of the city in general, for the reason that it brought out the fact that there appears to be no law that requires obstructions on the sidewalks to be marked by red lights or otherwise. The case was tried last week in Court of Common Pleas No. 1, before Judge Beitler. The plaintiffs sued for $15,000 damages, and a verdict was rendered for the defence. From the testimony adduced it appears that Mrs. Fox, on the evening of March 31, last year, fell over some boards laid around a lamp post in front of 2123 North 11th street, and suffered injuries of the back. Mr. Murray, who was employed by the U. G. I. Company, under contract, had planted a lamp post at that place, and upon replacing the cement sidewalk around the post had laid boards over it to protect the soft cement, and had placed no red light or other signal to warn pedestrains of the obstruction. The defence showed that there was plenty of clear space for pedestrains to pass, and that the lamp was lighted; also that other persons, including some of the witnesses for the plaintiff, who testified to seeing her when she fell, also saw the boards upon which she had fallen from some distance. The Judge's charge to the jury touched upon the obligation of persons walking on the sidewalks to exercise care and caution. 'Negligence, under the law,' he said, 'is the failure to do something that under the circumstances a reasonably cautious and prudent man ought to do, or the doing of something which a reasonably cautious and prudent man ought not to do." He decided that, as Murray had taken the contract to do the work for the Company, and assumed all responsibility for accidents, the Company could not be held liable, though counsel for the plaintiff argued that the gas lease provided that the Company alone should be responsible, and not any of its contractors, Judge Beitler said that the provision quoted only required the Company to save the city from damages. The jury, after considering the case for some time, returned to the court room, and the foreman asked the Judge: 'Ought there to have been a red light other than what was there? Is there any law requiring a red light to be placee there?" Judge Beitler replied: 'There is no law providing that red lights shall be placed upon openings or places of that sort. It is a question for you to decide what the defendant ought to have done. If he did not do all that he ought to have done, you are entitled to draw the inference of negligence. You must decide what a reasonably cautious and prudent man ought to have done that night and at that place. There is no law, however, providing for the maintenance of red lights over obstructions. While we see them frequently, it is simply the care that the people who put them there take to prevent accidents. There is no law that I know of that requires them to be put on.' It would appear from an examination of the digest of our laws and ordinances relating to the city that the only regulation on the subject of red lights is the ordinance of Councils of June 7, 1872, which provides: 'That all contractors, owners or occupants of buildings or others placing building materials of any kind or any other obstructions or excavations upon or across the cartway of any public thoroughfares in this city, shall place and keep thereon from sunset to sunrise a lighted lantern of red glass, and wherever such obstructions or excavations exceed 10 feet in length or breadth, one such lantern shall be placed upon each end thereof.'"

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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AGENTS:
New York—American News Co. 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JAN. 22, 1900.

The Market for Gas Securities.

A restricted market and rumors of discontent in the shareholding ranks of the Consolidated Company caused the latter to sell well below 190 last week. The close to-day (Friday) was 187 to 188. George Alfred Lamb's circular asking that disgruntled shareholders should be present at the annual meeting to-day of the Consolidated is a trifle on the display order. It certainty brought money in the way of advertising to the newspapers, and it and his antics will have no effect whatever on the management of the Company, who are in every sense inclined to and are capable of doing complete justice to every shareholder. It is our belief that at the meeting enough of the purposes of the Company will be divulged to send Consolidated up several points. The dirty mess in the Standard deal is not only messy but ridiculous. Standard common is reported at 95 to 115. Amsterdams are weaker.

Outside shares are generally strong, especially in respect of United Gas Improvement Company, which advanced sharply on the news that the Company's capital was to be increased in the sum of 50 per cent.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JAN. 22.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	187	188
Central Union, Bonds, 5's.	3,000,000	1,000	107½	108½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	18
Metropolitan Bonds	658,000	.	108	112
Mutual	3,500,000	100	300	305
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.	13,000,000	100	22	23
Preferred	10,000,000	100	46	48
Bonds, 5's	11,000,000	1,000	94	95
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	95	..
Preferred	5,000,000	100	125	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	110	114
Yonkers	299,65	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	143	145
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1⅛	1⅜
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	40	..
" 1st Mtg. 5's	475,000	1,000	96½	19½
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	71
Buffalo City Gas Co.	5,500,000	100	9	11
" " Bonds, 5's	5,250,000	1,000	84	85
Central, San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,207,000	1,000	106	108
Columbus (O.) Gas Lt. & Heating Co	1,682,780	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	105
Cincinnati G. & C. Co.	8,500,000	100	193½	194½
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	53¾	54
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	380,000	1,000	87	90
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,560,000	50	95¾	96
" Prior Lien 5's	4,598,000	1,000	99½	100
Detroit Gas Co., 5's	386,000	1,000	100	101
" Inc. 5's	16,000	100	100½	101
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds	2,000,000	..	80	85
Grand Rapids Gas Lt. Co..	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	220
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	102	105
Indianapolis	2,000,000	..	122	128
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co	250,000	50	72	78
" 1st Mtg. 5's	250,000	1,000	101	102½
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	
Laclede, St. Louis	7,500,000	100	79	80
Preferred	2,500,000	100	95	100
Bonds	10,000,000	1,000	107	
Madison Gas & Elec. Co.	400,000	100	82	
" 1st Mtg. 6's	350,000	1,000	102½	108
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	16,000,000	..	50	60
Bonds, 6's	4,600,000	..	107	108
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	43	45
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	103⅛	103¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111⅜	111½x
2d "	2,500,000	1,000	104	105
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	49	50
St. Paul Gas Light Co	1,500,000	100	57½	58½
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	88	90½
St. Joseph Gas Co	1,000,000	100	42	44
" 1st Mtg. 5's	750,000	1,000	96½	98
Syracuse, N. Y.	1,750,000	100	15½	18
Bonds	1,612 000	1,000	81	84
Washington, D. C	2,600,000	20	285	..
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	106¾	107¾
Bonds, 5's	3,880,500	.	106	108
Wilmington, Del.	600,000		220	50

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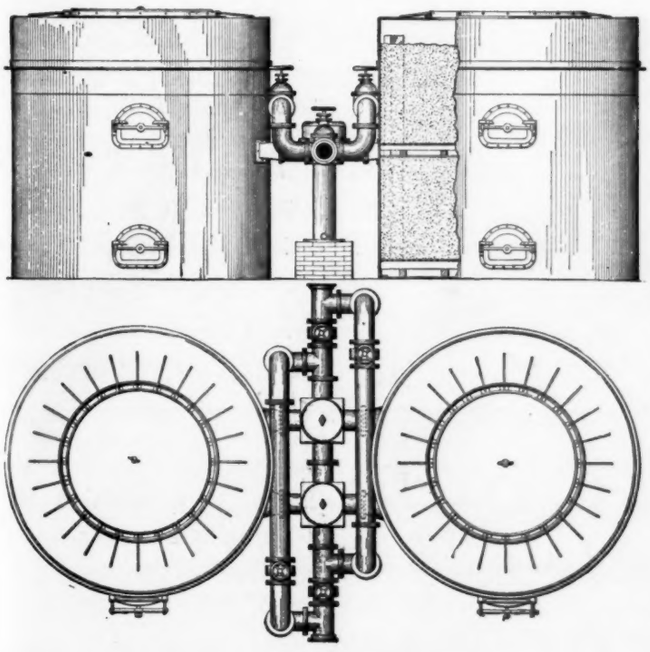

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Montreal,	500,000
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Wilkesbarre, Pa.	750,000
St. Catherine's (Second Contract),	250,000
Buffalo, N. Y.	2,000,000
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Colchester, Eng. (Second Contract),	300,000
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Rochester, Eng.	500,000
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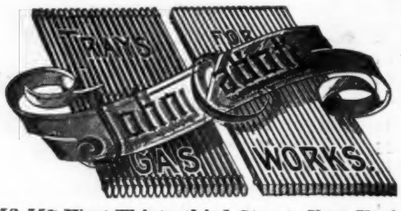

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130 "	.	5 "	.	6½	"	"
250 "	.	6 "	.	8	"	"
330 "	.	7 "	.	9¾	"	"
430 "	.	8 "	.	11¼	"	"
80 "	.	9 "	.	13	"	"
100 "	.	10 "	.	15	"	"
50 "	.	10 "	.	16	"	"
225 "	.	12 "	.	20½	"	"

I BEAMS.

110 bars	.	3-inch	.	5½	pounds	per	ft.
375 "	.	4 "	.	7½	"	"
330 "	.	5 "	.	9¾	"	"
155 "	.	6 "	.	12¼	"	"
200 "	.	7 "	.	15	"	"
50 "	.	7 "	.	12¼	"	"
250 "	.	8 "	.	17½	"	"
95 "	.	9 "	.	21	"	"
155 "	.	10 "	.	25	"	"
200 "	.	12 "	.	31½	"	"
200 "	.	12 "	.	40	"	"
265 "	.	15 "	.	42	"	"
150 "	.	15 "	.	50	"	"
180 "	.	15 "	.	60	"	"
25 "	.	20 "	.	65	"	"

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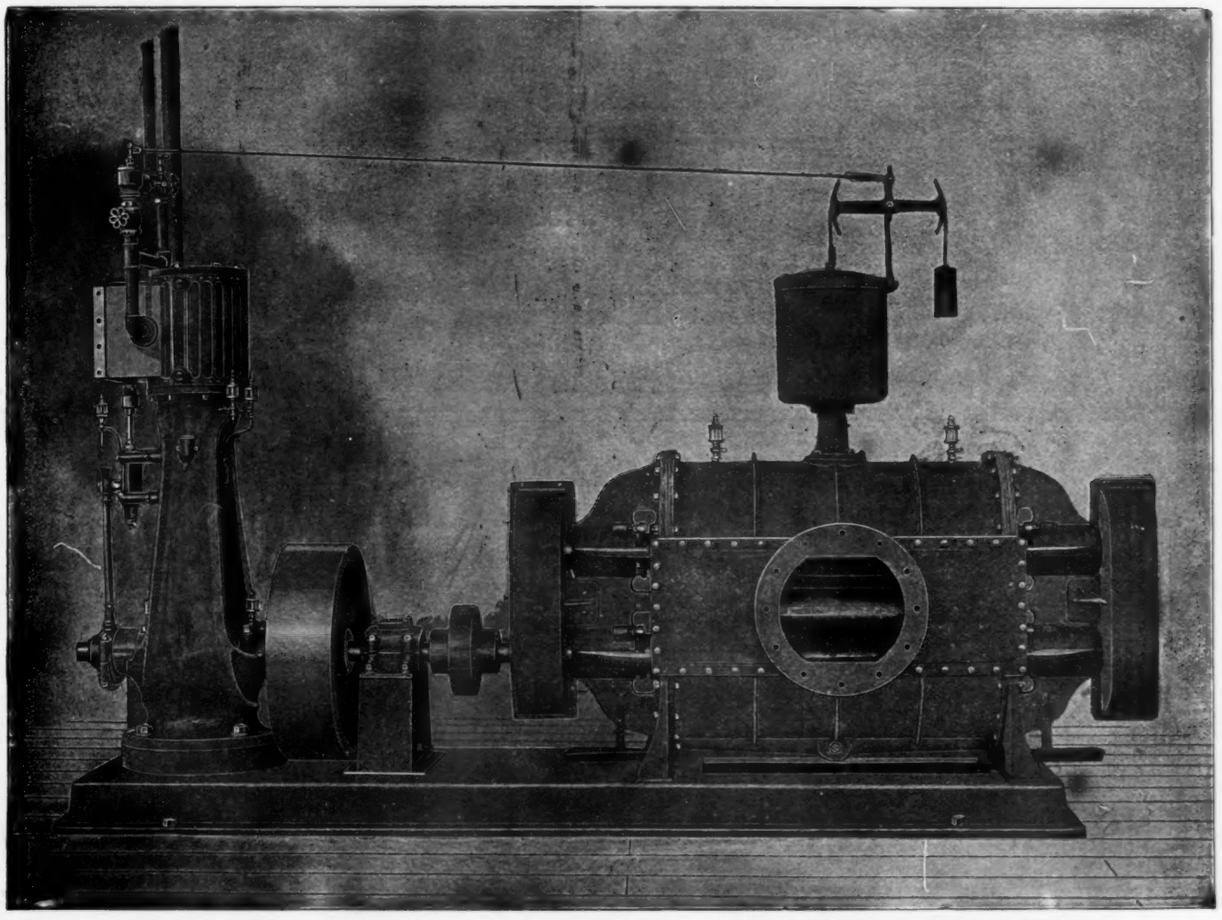

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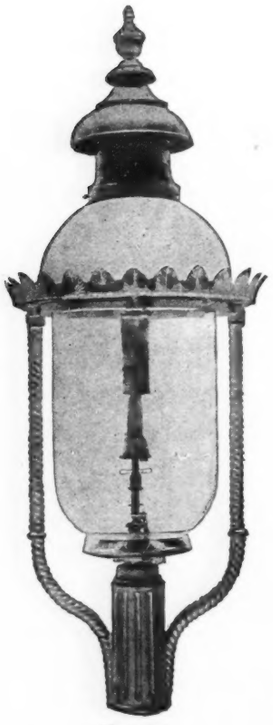

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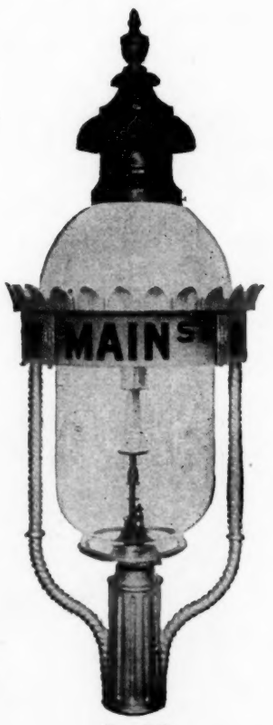

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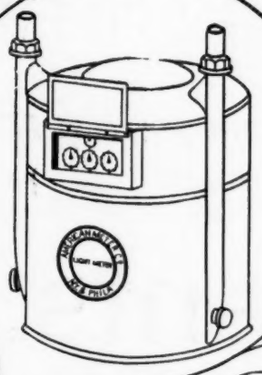

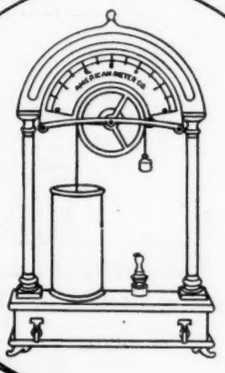

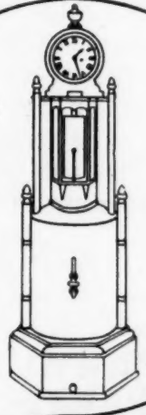

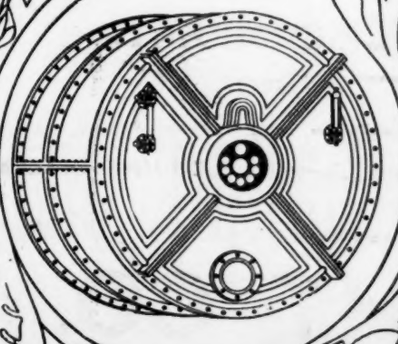

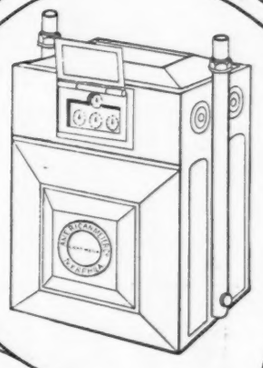

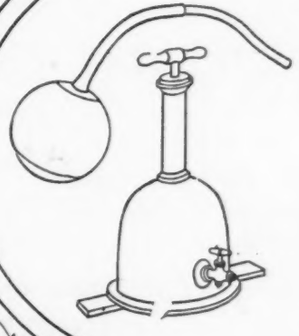

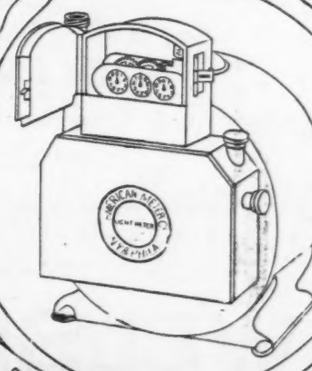

PUBLIC LIGHTING TABLE.

FEBRUARY, 1900.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	5.50 PM	6.10 AM	5.05	6.15
Fri.	2	5.50	6.10	5.05	6.15
Sat.	3	5.50	6.10	5.05	6.15
Sun.	4	10.20	6.00	5.05	6.15
Mon.	5	11 30	6.00	5.10	6.10
Tue.	6	12.40 AM FM	6.00	5.10	6.10
Wed.	7	1.40	6.00	5.10	6.10
Thu.	8	2.30	6.00	5.10	6.10
Fri.	9	3.20	6.00	5.10	6.10
Sat.	10	4.00	6.00	5.10	6.10
Sun.	11	4.40	6.00	5.10	6.10
Mon.	12	5.10	6.00	5.20	5.55
Tue.	13	No L.	No L.	5.20	5.55
Wed.	14	No L. FM	No L.	5.20	5.55
Thu.	15	No L.	No L.	5.20	5.55
Fri.	16	6.10 PM	9.00 PM	5.20	5.55
Sat.	17	6.10	9.50	5.20	5.55
Sun.	18	6.10	10.50	5.20	5.55
Mon.	19	6.10	11.50	5 30	5.55
Tue.	20	6.10	12.50 AM	5.30	5.55
Wed.	21	6.10	1.50	5.30	5.55
Thu.	22	6.10 LQ	2.50	5.30	5.55
Fri.	23	6.10	3.40	5.30	5.55
Sat.	24	6.10	4.40	5.30	5.55
Sun.	25	6.20	5.30	5.30	5.55
Mon.	26	6.20	5.30	5.30	5.45
Tue.	27	6.20	5.30	5.30	5.45
Wed.	28	6.20 NM	5.30	5.30	5.45

TOTAL HOURS LIGHTING DURING 1900.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	230.50	January	423.20
February	175.40	February	355.25
March	189.00	March	355.35
April	160.30	April	298.50
May	150.40	May	264.50
June	137.00	June	234.25
July	152 00	July	243.45
August	171.50	August	280.25
September	187.20	September	321.15
October	213.10	October	374.30
November	221.50	November	401.40
December	231.50	December	433.45
Total, yr.	2221.40	Total, yr.	3987.45

THE RECENT DECISION.

The United States Circuit Court of Appeals,

In Its Opinion of December 7, 1899,

FINALLY AND FULLY SUSTAINS THE WELSBACH COMPANY'S PATENT.

DEALERS and USERS and MANUFACTURERS are CAUTIONED against INFRINGEMENT of the

Welsbach Patents.

Judge LACOMBE, in the United States Circuit Court, handed down the following opinion Saturday, Dec. 9, 1899.

On motion to restrain complainant from sending circulars to the customers of American Incandescent Lamp Company.

LACOMBE, Circuit Judge.

Irrespective entirely of the preliminary objection that affirmative relief of this sort will not be granted to defendant—a question not now passed upon—there seem no good grounds for criticism of complainant's circular. It states that Judge Townsend enjoined the "manufacture and sale" of infringing mantles, and he did grant such an injunction. And this Court has enjoined the sale of mantles which the person enjoined did not himself manufacture, when his past conduct in the matter of infringement created a special equity in favor of the complainant against him. It is true that the circular goes further, and threatens suit against persons who sell mantles, but who never have been at all concerned in manufacturing or causing them to be manufactured.

In other words, it threatens suit upon the patent as if it were a patent for a product. But the complainant insists that the threat is made in good faith; that it intends to bring suits against sellers of the infringing mantles upon the theory that the patent is really one for a product. In view of the peculiar language of the claim, this Court is not now prepared to hold that such contention would be wholly without merit, or that the complainant could not succeed against a mere seller. Moreover, it is contended that the seller of a purchased mantle himself promotes the taking of the final step in the process, and such contention has not yet been passed upon adversely to complainant. These are questions which should be left to be determined in one of such suits, rather than here. If complainant intends to prosecute one or more sellers, and there is nothing before the Court to induce a disbelief in its assertion that it does so intend, it would seem to be its proper course to warn dealers to desist from selling.

December 9, 1899.

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ST. LOUIS INCANDESCENT MANTLE COMPANY.
ECKERLE ELECTRICAL COMPANY.
H. KUPFER.
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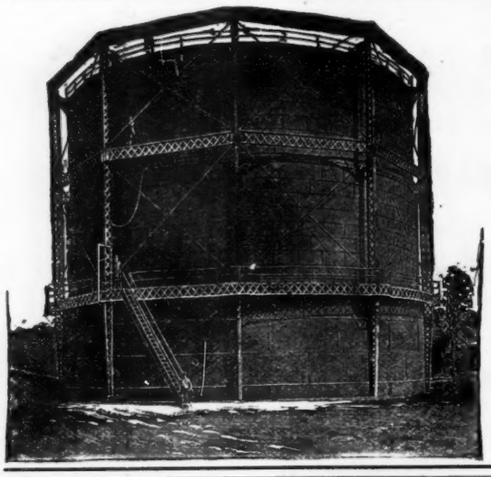

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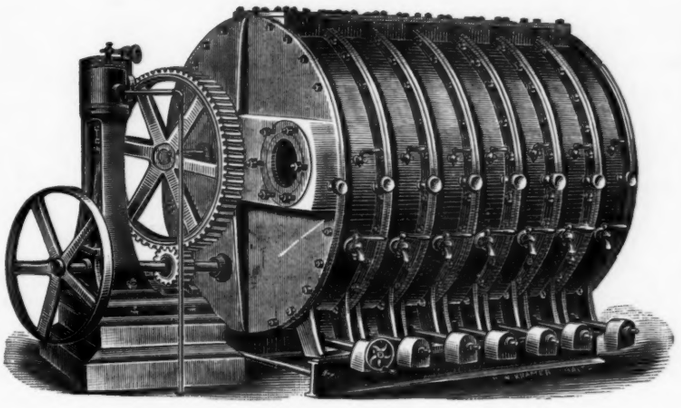

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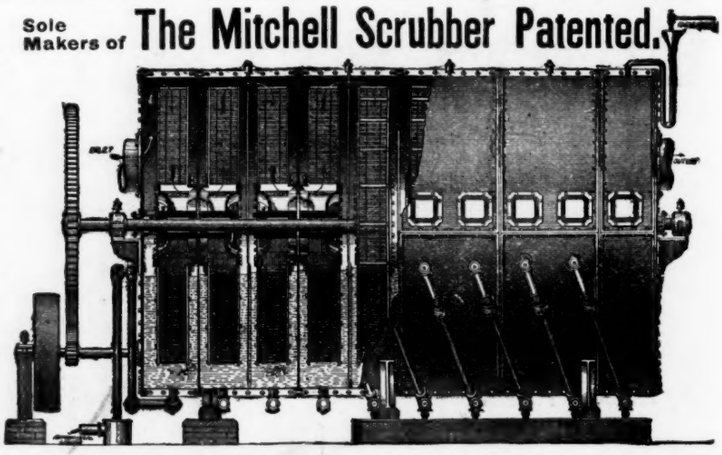

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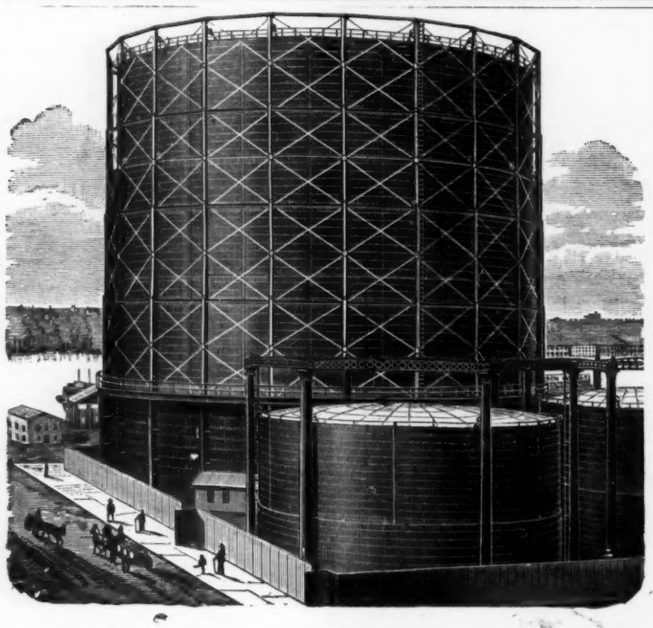

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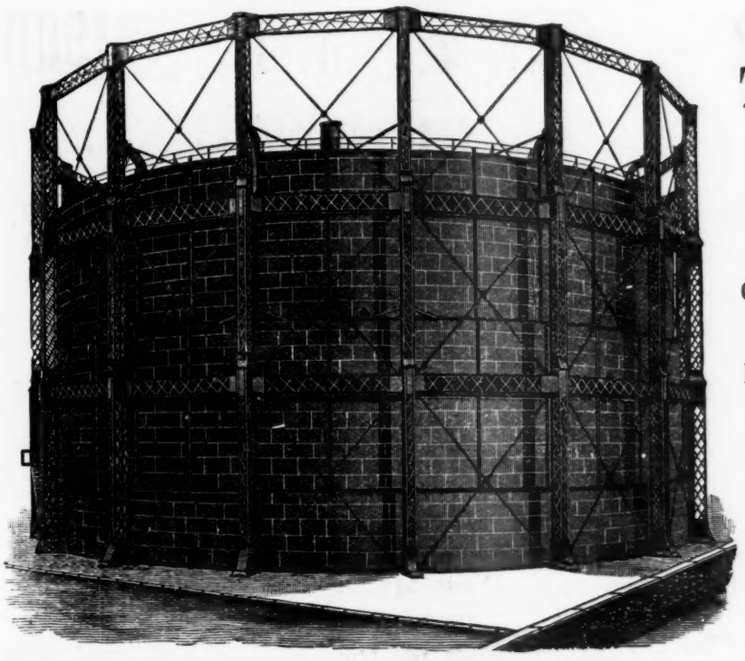

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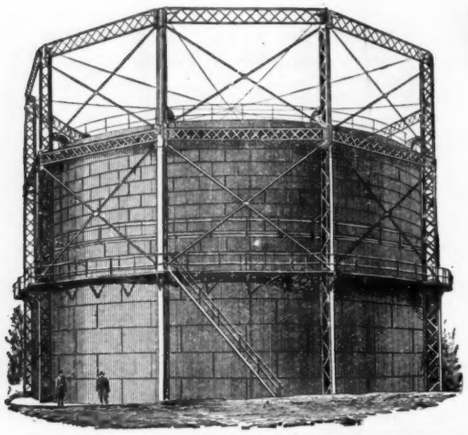

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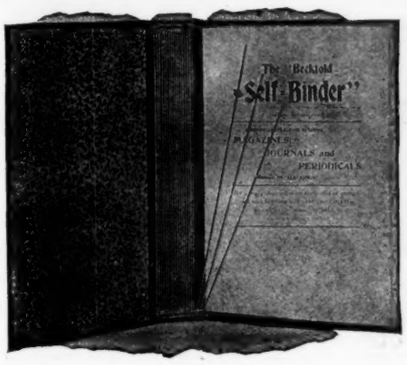

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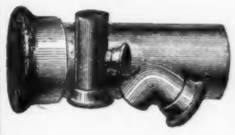

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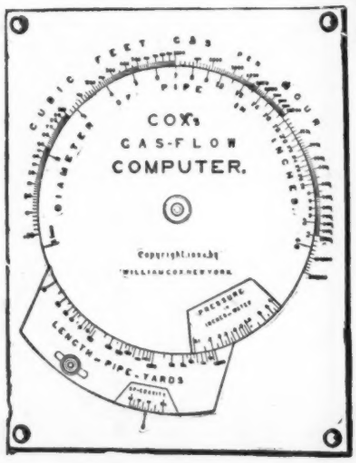

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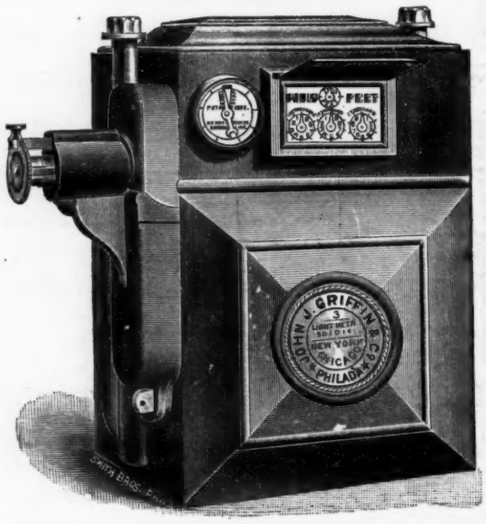

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